MAY

THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

1923

Relation of Maxillary Sinus to Surrounding Structures—*Rasmussen*

Relation of Diet to the Teeth—*Marshall*

Relation Between Dental Conditions and Health and Development of Children—*Cross*

Muscular Influence—*Allen*

Rules in Deciding What Teeth Should be Root-Filled—*Grieves*

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Minimum Requirements for Class A Dental Schools

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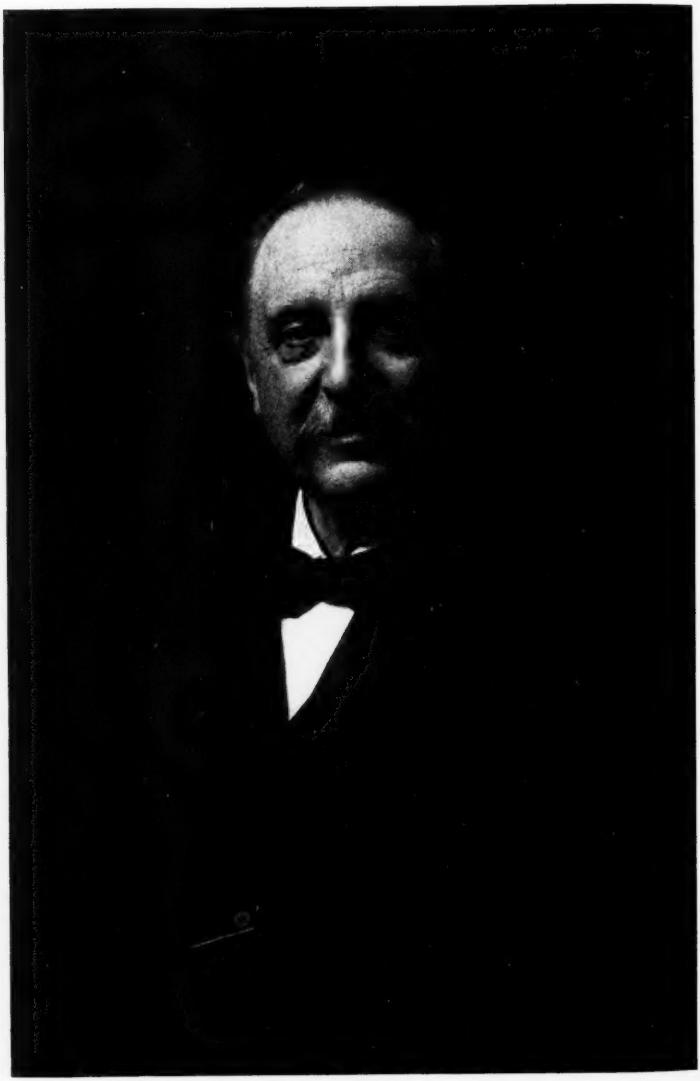

GEORGE B. SNOW, D.D.S.
1835–1923

THE JOURNAL
OF THE
American Dental Association
VOL. 10 MAY, 1923 NO. 5

Original Communications

THE SURGICAL SIGNIFICANCE OF THE ANATOMICAL RELATION OF THE MAXILLARY SINUS TO THE SURROUNDING STRUCTURES

By A. T. RASMUSSEN, M.D., D.D.S., LaCrosse, Wisconsin

(Read before the American Dental Association, Los Angeles, California, July 17-21, 1922)

THE sinus maxillaris or Antrum of Highmore is the largest of the air cells or spaces of the facial or cranial bones and is situated within the body of the maxilla. The other bones which help form the cavity are the palatine, malar and inferior turbinate. The typical form is that of an irregular pyramid, its base towards the nasal cavity and the apex pointing towards the malar prominence. It is usually described as having a base, apex, roof, floor anterior and posterior walls. Ventilation is accomplished through the ostium maxillary, situated near the roof of the sinus and opening into the infundibulum ethmoidale, this in turn through the hiatus semilunaris into the meatus nasi medius.

The capacity of the sinus varies greatly in different individuals and even in the same individual as shown by the works of Schaeffer, Cryer, Loeb and others.

Occasionally the cavity is found to be divided by a transverse bony septum into an anterior and posterior cavity. In such cases the posterior cavity opens into the infundibulum through a separate opening known as the ostium maxillare accessorium. Cryer believes this posterior cavity to be a palatal cell, that is, a cell within the orbital process of the palatine bone, rather than a true division of the maxillary sinus. Be that as it may, there are sometimes two distinct and separate cavities each with its own ostium opening into the infundibulum (Figs. 1 and 2).

There sometimes exists a more or less complete division of the sinus in the

upper anterior portion of it, forming, what Cryer calls an infraorbital sinus. My own observations lead me to believe that the septum forming the infraorbital sinus is not usually, if ever, com-

Fig. 1.—Vertical anteroposterior section showing sinus divided into anterior and posterior cavities. (Cryer)

plete but that an opening exists into the maxillary sinus proper (Figs. 3 and 4).

The cavity may be and frequently is partially divided by other bony or membranous septa. These may be transverse

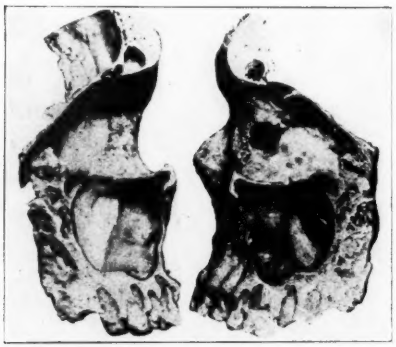

Fig. 2.—Vertical anteroposterior section showing sinus divided into anterior and posterior cavities. (Cryer)

or longitudinal; vertical or horizontal. The fact that septa more or less completely divide the sinus should put the surgeon on guard against overlooking any of these peculiarities and mistaking such septa for the limiting walls of the sinus (Figs. 5, 6, 7).

The cavity is lined with a delicate mucous membrane of the ciliated epi-

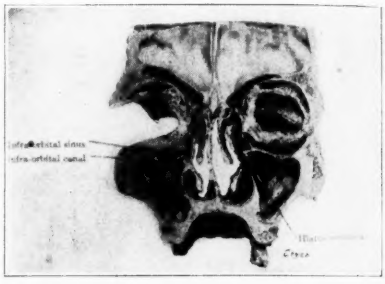

Fig. 3.—Posterior view of vertical transverse section showing infraorbital sinus with infraorbital canal in septum. Right hiatus semilunaris communicates with maxillary sinus without a true ostium maxillare. (Cryer)

thelial type of cells. The function of the antral cavity is undoubtedly to give resonance to the voice. This sinus is

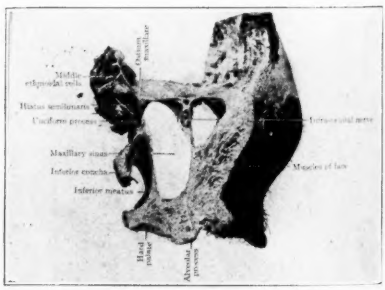

Fig. 4.—Vertical transverse section showing infraorbital sinus with infraorbital canal in septum. Shows beautifully the unciform process with ostium maxillare opening into infundibulum. (Cryer)

intimately associated with the surrounding anatomical structures and bears an important relation to them and the entire body in both health and disease.

RELATION TO THE NASAL CAVITY

The antrum is situated just lateral to the nasal cavity and is separated from the

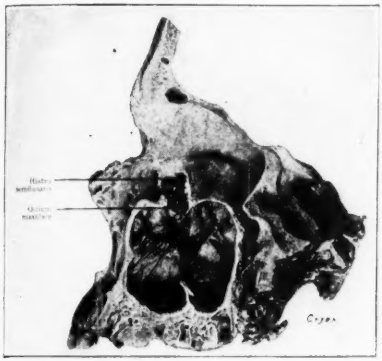

Fig. 5.—Anteroposterior section showing position of ostium maxillare and a vertical transverse bony septum partially dividing the sinus. (Cryer)

latter by a thin bony wall, formed by the maxillary, palatine and inferior turbinate bones. With the ostium maxillare

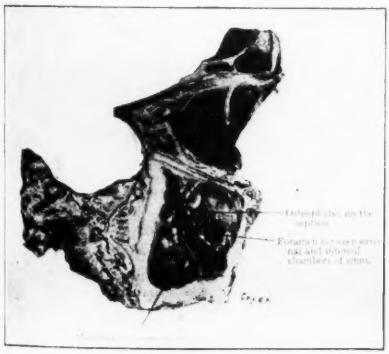

Fig. 6.—Anteroposterior section showing anteroposterior membranous septum partially dividing maxillary sinus into an internal and external cavity. (Cryer)

establishing direct communication, as it does, between the nasal cavity and the antrum it is readily seen how a diseased condition of the nasal cavity may reach the antrum through continuity of tissues or as a result of infectious secretions from the nose finding their way through

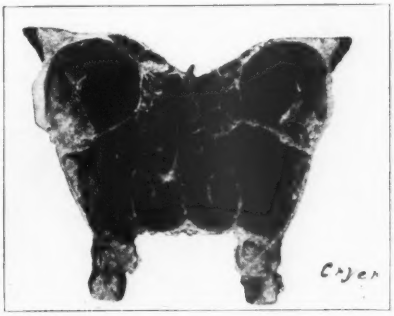

Fig. 7.—Anterior view of vertical, transverse section of old person, showing thin walls of sinus and membranous septa partially dividing it. (Cryer)

the ostium into the maxillary sinus itself (Figs. 3, 7, 8).

This is seen in cases of the eruptive fevers and diphtheria which usually in-

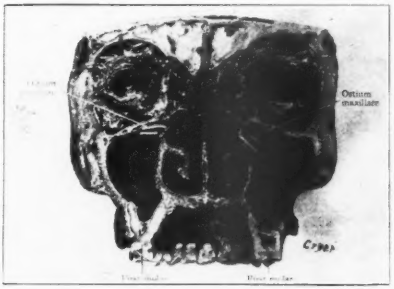

Fig. 8.—Posterior view of vertical transverse section showing position of ostium maxillare as indicated by cord passed through each one. Floor of sinus very much lower than floor of nasal cavity, dipping down between molar roots. Note thin lamina of bone covering tooth roots. (Cryer)

volve the nasal cavity and the sinuses and is frequently the cause of chronic pathological conditions of the antrum.

Orbital Relation

The orbit is situated immediately above the maxillary sinus and is separated from it by the orbital plates of the palate and maxillary bones, a parchment-like bony structure. It forms at once the roof of the sinus and the floor of the orbit. The structure is so thin that in cases of acute infections of the sinus, in which the ostium has become closed as a result of the congestion of the mucosa, the pressure will cause the roof of the sinus to bulge into the orbit bringing pressure upon the orbital contents and causing the eye to protrude. The same result would occur from the growth of a tumor within the antral cavity when pressure reached the orbital plate. It is easy to see how a cellulitis within the orbit might result from an acute infection of the sinus with closure of the ostium (Fig. 7).

Relation to Oral Cavity

The anterior wall of the sinus forms the canine fossa and very often the bone is so thin that it will give perceptibly to digital pressure.

The posterior wall is formed by the maxilla supported posteriorly by the pterygoid process of the sphenoid bone. In some cases even the posterior wall is very thin. I have a skull in which the bony walls, separating the sinus from the oral cavity, is no more than one and five tenths millimeters in thickness at any point, except the floor. In the skull referred to the maxillary sinus extends well into the malar prominence and it is just below this point that we find the greatest thickness. It will be seen from this that in some cases all of the walls separating the antrum from the oral cavity may be very thin and that such a wall might easily be fractured by a blow or other undue force (Fig. 7).

The floor is generally the heaviest of all the walls due to the alveolar process. It is usually lower than the floor of the nasal cavity, sometimes very much lower. Generally speaking the floor is somewhat concave and often quite irregular, due to the roots of teeth projecting up into the cavity and covered only by a very thin bony plate or more rarely by mucoperiosteum only. Any of the upper bi-

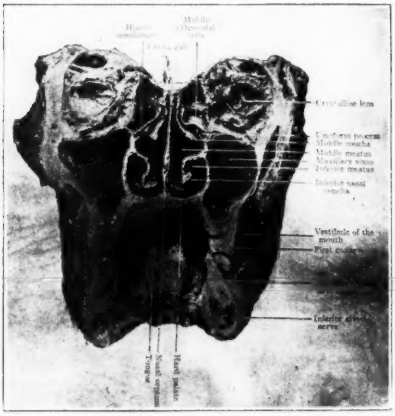

Fig. 9.—Vertical transverse section showing relation of maxillary sinus to nasal cavity. Floor of sinus much lower than floor of nose. Transverse, horizontal septa dividing antrum. (Cryer)

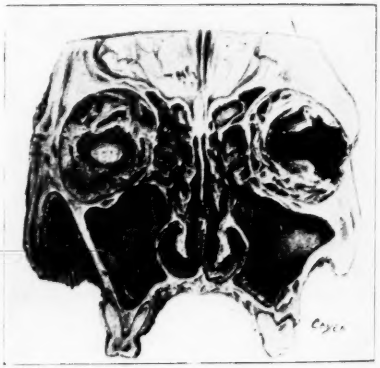

Fig. 10.—Posterior view of vertical, transverse section showing large maxillary sinuses and narrow nasal cavity. Floor of sinus much lower than floor of nose. Close proximity of tooth roots to sinus. (Cryer)

cuspid or molar teeth may thus project into the antral cavity (Figs. 7, 8, 9, 10).

From this brief description we note that the antral cavity is separated from

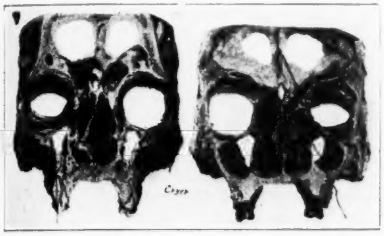

Fig. 11.—Anterior and posterior views of vertical transverse sections showing probe passing from frontal sinus through infundibulum and ostium maxillare into maxillary sinus. (Cryer)

the nasal, orbital and oral cavities by thin osseous structures.

Cystomata or other benign tumors within the sinus maxillaris frequently cause pressure necrosis of these thin walls. Entire nasal, orbital and anterior walls may be destroyed in this manner. Commonly, a periapical ab-

Fig. 12.—Posterior view of vertical transverse section. Right frontal, ethmoidal and maxillary sinuses form a common cavity. (Cryer)

scess or chronic osteomylitis may destroy all or part of the floor of the sinus.

Malignant neoplasms of the antrum, by invading the surrounding structures will destroy all of the walls and surrounding parts and give rise to many reflexes due to the complex nervous arrangement. Metastasis follows here as elsewhere.

Frontal–Ethmoidal–Maxillary Relation

The ethmoidal labyrinth of cells is situated within the ethmoid bone, be-

Fig. 13.—Drawing from specimen. Upper, nasofrontal duct opening into middle meatus, the upper end of infundibulum ending blindly. Lower, nasofrontal duct opening directly into infundibulum. (Schaeffer)

tween the orbits and on a higher plane than the maxillary sinus. These cells are divided into three groups; anterior, middle and posterior. The septa form-

ing these cells are extremely thin with openings leading from one to the other, in many instances. The anterior and middle groups of cells open into the infundibulum or hiatus semilunaris (Fig. 7). While the opening or openings leading from the posterior group to the nasal cavity opens into the superior meatus and therefore not directly into the maxillary sinus, yet the relation of the posterior to the middle and anterior group is so intimate and the walls separating them so extremely thin that any

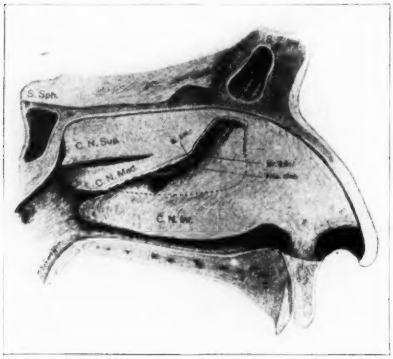

Fig. 14.—Drawing from specimen showing two nasofrontal ducts as indicated by arrows, one opening into infundibulum and the other into middle meatus of nose. (Schaeffer)

pathological condition obtaining in one group or the other is prone to reach all three groups because of the anatomical peculiarities just described, aside from the probability of direct communication between all groups.

The frontal sinus within the lower portion of the frontal bone is situated at a still higher plane than the ethmoidal. The nasofrontal canal or duct leads either into the anterior superior end of the infundibulum ethmoidale or directly into the superior meatus of the nose (Figs. 13 and 14).

The infundibulum is a gutter-like groove leading from the frontal sinus to the ostium maxillaire, the groove itself often ending in a pouch into which the ostium maxillare opens (Fig. 13). The ethmoidal cells open into the infundibulum. It therefore acts as a gutter or groove through which secretions from the frontal and ethmoidal sinuses reach the maxillary sinus. Schaeffer says "the sinus maxillaris, therefore, acts as a reservoir for fluids coming to the dorsal end of the infundibulum ethmoidale (the ostium maxillare being patent)." The fact that the infundibulum leads directly into the maxillary sinus in many cases was first pointed out by Cryer (Figs. 3 and 11). Later Schaeffer found that in fifty-six per cent of all cases examined this condition exists. Cryer, Bryan, Brophy and Schaeffer have reported cases of the frontal sinus opening directly into the maxillary sinus. Schaeffer terms such an opening the maxillofrontal duct.

In two cases operated upon I have been able to verify this condition by passing a probe from the frontal directly into the maxillary sinus (Fig. 12).

It will thus be seen that there is a direct relation between the frontal, ethmoidal and maxillary sinuses which is of great surgical importance. A diseased condition of any may and does reach the other sinuses mentioned by the infectious secretions or the continuity of tissue.

Relation to Sphenoidal Sinus

The sphenoidal sinus communicates with the spheno-ethmoidal recess. It will be noted that the sphenoidal is not so directly connected with the maxillary sinus as are the frontal and ethmoidal. However it is evident that a diseased condition of one or the other of these sinuses may reach any or all of the others. Gravity may carry infectious material downwards thus involving those structures lower than the original site of the disease, it may pass upwards by continuity of tissue, or be forced into the various sinuses by undue efforts to clear

the nasal cavity of accumulated secretions.

Dental Relation

The maxillary sinus bears an important relation to the teeth from infancy to old age. The cavity begins to form about the fourth month of intra-uterine life. From this time until the permanent teeth have all erupted the body of the maxillary bone is largely occupied by the dental organs both temporary and permanent. The antral cavity increases in size in direct proportion to the eruption of the teeth so that when all the permanent teeth are in place we have the normal adult antrum.

Fig. 15.—Left, x-ray of case showing close proximity of cuspid root to anterior wall of maxillary sinus; also chronic osteomyelitis, resulting from periapical abscess of lateral incisor, destroying the anterior wall of the antrum, with general infection of the antrum resulting. Note thin lamina of bone covering apex of bicuspid tooth.

Right, x-ray of case showing case of chronic osteomyelitis, of gingival origin, destroying the floor of the antrum with infection of that cavity following.

Cryer has pointed out that the resorption of the walls of the sinus continues, even to old age, when all of the walls may become extremely thin (Fig. 7). My own clinical experience seems to bear out this statement. It is certain that we often find the floor of the sinus extremely thin in older patients where some or all of the posterior teeth have been lost. When the permanent teeth are all in place and the roots fully formed we find that the floor of the sinus often dips down; particularly between the roots of the molar and bicuspid teeth, thus leaving the apices of these roots projecting up above the floor of the antrum and covered only by a very thin lamina of bone. Fortunately, however, this is often found to be quite dense (Figs. 8, 15, 16). Occasionally we find cases where the bony plate covering these roots is missing and the apex is covered only by the mucoperiosteum lining the sinus.

It is not an unusual thing to find the apex of the cuspid root approaching very close or impinging upon the floor of the sinus and occasionally I have seen the apex of a lateral incisor in very close proximity to the anterior part of the floor (Fig. 15). Especially is this true where there is a distal flexion of the apical half or third of that root. Permit me to call attention to the fact that the young do not often suffer from chronic infections of the maxillary sinus. I believe this to be due to two things. First, the chance of a periapical abscess having discharged into the sinus is very much less in youth than in later life. Second, the floor of the sinus is very much higher in youth than later in life and therefore any infected material, finding its way into the sinus from the nasal cavity, is more easily expelled through the ostium maxillare than it is in later years, when the floor is so much lower. In addition we must, of course remember, that the resistance of the youth to infections of this nature is very much higher than in the later years of life.

With these anatomical relations in mind, it is clearly to be seen that there is grave danger of a periapical abscess finding its way into the antral cavity. I often marvel that more of these abscesses do not thus break through. Were it not for the resistance put forth by nature, it is reasonable to believe that a large portion of periapical abscesses would find their way through this thin bony structure into the sinus. I believe Cryer is right when he points out that "the osteogenetic function of this region is to stimulate activities with the result that a new layer

of bone is established which covers these parts and protects the cavity." Nevertheless this lamina of bone often is destroyed, the abscess discharging into the sinus.

Osteomylitis, acute or chronic, may be the cause of the floor of the sinus being destroyed, with infection resulting. Osteomylitis may result from a blow or other undue force applied to the teeth either accidently or in dental operations; a chronic case may be the result of a periapical infection or have its beginning at the gingival border (Fig. 15). It

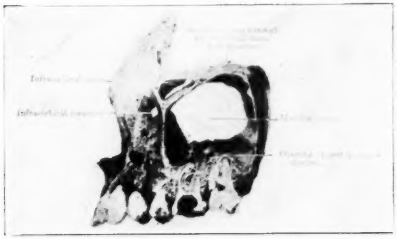

Fig. 16.—Vertical anteroposterior section showing infraorbital sinus; also close proximity of root apices to floor of antrum. (Cryer)

should be noted here that due care must be exercised in the removal of the teeth, keeping in mind the possibility of fracturing the antral walls, or even carrying away a section of it with the tooth or teeth being removed. Also the danger of using undue force in applying the dental forceps, bearing in mind the danger of forcing an infected tooth root through the floor of the sinus.

When there is a serious malocclusion of the teeth their relation to the sinus may be much modified. In cases of impacted teeth we sometimes find the walls or floor of the cavity greatly displaced. Malposed teeth are sometimes found erupting into the antrum. We occasionally find teeth impacted within the anterior or posterior wall.

Relation to the Pharynx

The anatomical relation which the maxillary and other sinuses, bear to the pharynx is such that secretions or infectious materials from the sinus or sinuses, reaching the nasal cavity, find their way into the pharynx and cause a more or less severe irritation of the mucous membrane lining that organ. This is especially true in chronic cases of infection where the acrid accumulations have been reaching the pharynx for some time. Cases of pharyngitis of long standing have been observed which recovered at once upon the clearing up of a chronic sinusitis.

From my own clinical experience I am satisfied that in some cases hay fever is greatly aggravated, if not caused, by a chronically infected sinus or sinuses.

Clinical observation has further taught me that in numerous cases of so-called nasal catarrh the real trouble has been an infected sinus. In fact so frequently has this impressed itself that I am ready to believe that most cases are in reality chronic infections of one or more of the sinuses, the discharge finding its way into the nasopharynx.

Through the lymph and blood streams the toxic effects of certain pathological conditions of the antrum are carried to the remotest parts of the body. The antral cavity as well as all of the sinuses should receive the most careful consideration in every case of general debility or any of the other disorders known to arise as a result of chronic infection.

Blood Supply

The blood vessels in immediate relation to the antral cavity and with which the surgeon is concerned in operating in this area are the alveolar branch of the second division of the internal maxillary artery, which supplies the antrum, alveolar process, bicuspids and molar teeth and gums; the infraorbital artery which lies in a canal in the roof of the sinus; the

terminal branches of the infraorbital artery supplying the lip, the mucoperiosteum and gum tissue over the facial wall of the antrum and the incisor and cuspid teeth and process, also the pterygoid plexus of veins which carries the blood from the parts.

Relation to Nerve Trunks

The fifth cranial nerve enervates all of the walls of the maxillary sinus and it is with the various branches of this nerve that the surgeon has to deal in all operations upon the antrum.

The infraorbital nerve accompanies the infraorbital artery in a groove or canal in the floor of the orbit, the terminal branches being distributed through the lip and mucoperiosteum overlying the incisor and cuspid regions. The anterior superior dental nerve lies in a groove or canal in the inner surface of the anterior wall of the sinus, passing downward into the alveolar process to help form the dental plexus. The middle superior dental nerve, arising from the posterior part of the infraorbital canal, descends through a canal or groove in the outer wall of the sinus, to the dental plexus. The posterior superior dental nerve arises in the sphenomaxillary fossa, passing downward on the posterior surface of the maxilla, through the posterior dental canal, and in turn helps form the dental plexus. Some branches of this latter nerve are distributed to the mucous membrane lining the antral cavity and others to the gums and mucous membrane over the posterior teeth (Fig. 17).

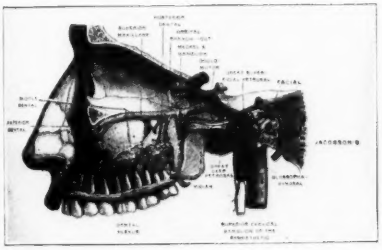

Fig. 17.—Dental branches of second division of fifth nerve and sphenopalatine ganglion. Also shows anastamosis with the seventh cranial nerve. (Testut)

From this it would seem at first glance that the nerve supply of the antrum is quite simple. On the contrary, however, due to the complex make-up of the fifth nerve and its anastomosis with other nerves through the ganglia, to which it furnishes nerve roots, the nervous complications to which pathological conditions of the sinus give rise, are many and varied.

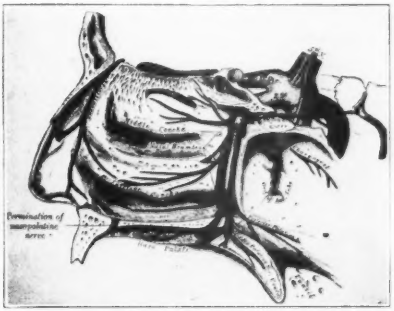

Fig. 18.—The sphenopalatine ganglion and its branches. (Gray)

The sensory roots of the sphenopalatine ganglion are derived from the second division of the fifth nerve; the motor and sympathetic roots from the Vidian. The branches of this ganglion being widely distributed through the orbit, nasal cavity, hard and soft palate, pharynx and sphenoidal sinus, the possibility of nervous reflexes is seen (Fig. 18).

According to Tiedemann, as quoted by Cryer, one branch of the sphenopalatine ganglion goes to the ophthalmic or ciliary ganglion, thus further complicating this already complex nerve arrangement. Through the Vidian nerve communication is established with the seventh cra-

nial nerve; also with the glossopharyngeal nerve, which in turn anastomoses with the pneumogastric and the spinal accessory nerves, the latter supplying fibers to the cervical and brachial plexus (Figs. 17, 18, 19). From this it will be seen that we may have reflex nervous disturbances of all the parts supplied by the nerves third. Through the Gassarian ganglion, the mandibular division of the fifth nerve and the otic ganglion, from which fibers reach the middle ear, there exists a direct nerve connection between this area and the sinus.

Through the Chorda tympani, the otic ganglion and the lingual nerve communi-

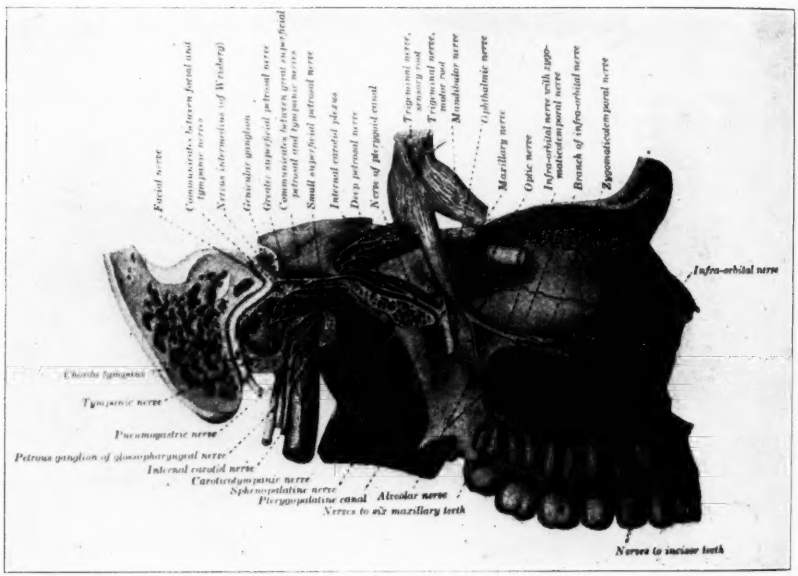

Fig. 19.—Showing anastomosis of the fifth cranial nerve with seventh, pneumogastric, glosso-pharyngeal, tympanic Chorda tympani, etc., through the sphenopalatine ganglion and Vidian nerve. (Modified from Sabbotta)

mentioned. A patient suffering from a severe case of neuritis affecting the arms, hands and inter-costal region, was referred to me. Examination revealed a chronic maxillary sinusitis. Operation for sinusitis gave immediate relief of all neuritic symptoms. Other similar, but less marked, cases have been noted.

The nasal branches of the fifth nerve furnish the sensory root to the ophthalmic ganglion while the motor root comes from the third cranial nerve. Thus we have established communication with the cation is established with the tongue; also the sub-maxillary and sub-lingual glands. Through the recurrent branch of the mandibular division of the fifth nerve, communication is established with the region of the mastoid cells and the petrous portion of the temporal bone.

In order to fully appreciate the complexity of the nervous arrangement mentioned it should be remembered that all of the ganglia have sensory, motor and sympathetic roots, thus widening the

range of nervous complications and reflexes that may arise.

Rationale of Surgical Procedures

It should be a rule in all surgery that the most direct route to the diseased area, compatible with the patient's safety and well-being, should be the route of choice. The least possible tissue should be removed in any surgical procedure. When any structure must be sacrificed and there is any choice in the matter, the organ or structure of least importance must be chosen.

In gaining access to the antral cavity, the most direct route is through the anterior wall. In performing extensive operations upon the sinus, less tissue need be removed here than by employing any other route.

When it is necessary to remove a large section of the wall, the opening so made in this region *will close,* while if the nasal wall were similarly removed, a large permanent opening remains. Great care should always be taken to keep the nasal wall intact, when possible.

Structures to Avoid

In operating upon this sinus the surgeon should be mindful of the fact that the nasal and orbital walls are very thin and no undue pressure should be put upon these structures. It has already been pointed out why the nasal wall should be carefully guarded, viz: to avoid having a permanent opening from the nasal cavity into the sinus. It is highly important that the roof of the cavity be not fractured or punctured during operation. Should this occur it would likely result in a cellulitis of the orbital tissues.

In cases of pressure necrosis of the nasal and orbital walls, as mentioned, the sequestra should be carefully removed, *leaving the mucoperiosteum intact,* in which case there will be a regeneration of the bony plates.

Care must be taken not to sever or destroy the infraorbital nerve in these operations. Especially is this true in those cases where an infraorbital sinus exists and the infraorbital canal passes through the thin bony plate separating this sinus from the true antral cavity. In such cases the infraorbital foramen is situated somewhat lower than usual and care should be exercised in the use of the periosteotome when elevating the periosteum from the bone, that the nerve be not severed (Figs. 3, 4).

A healthy tooth or one which, under proper treatment, can be made a useful organ should never be removed for the purpose of draining or gaining entrance to the antral cavity.

Field for the Specialist

In view of the close relationship which the maxillary sinus bears to the surrounding structures and the complexity of the nerve supply of these structures, the treatment of pathological conditions calls for the most intimate knowledge and highly specialized training on the part of the surgeon in order to safeguard the patient's health and well-being.

After nearly twenty years of study and clinical experience in a very wide range of cases it is my firm belief that the patient's best interests would be conserved if those in general practice would consult with the specialist in all sinus cases or wherever there might be a suspicion of such.

The oral surgeon, who is worthy of the name, should be better qualified to diagnose and treat any and all pathological conditions of the maxillary sinus and associated parts than the man in general practice, who sees only an occasional case and who cannot be so thoroughly familiar with the symptomatology and the anatomical structures as one who makes a specialty of this important and complex part of the anatomy.

Summary

1. The maxillary sinus is frequently divided into two or more recesses by bony or membranous septa.

2. It is impossible in some cases to drain the antral cavity even by repeated puncturing.

3. The nasal cavity is separated from the sinus by a very thin bony wall which should never be destroyed for the purpose of operating upon or maintaining drainage of the antrum.

4. The orbital plates of the maxillary and palatine bones form the floor of the orbit and roof of the antrum which is very thin and must be carefully guarded in all operations upon the parts.

5. The antrum is separated from the oral cavity by bony walls which sometimes are very thin in all places, even at the tuberosity.

6. The floor of the antrum is usually lower than the floor of the nasal cavity.

7. Roots of the teeth sometimes project into the sinus with no bone covering the apices.

8. Such an arrangement lends itself readily to an infection of the sinus from an infected tooth pulp or periapical abscess.

9. The frontal sinus drains into the maxillary sinus in more than half the cases. In some cases the frontal and maxillary sinuses communicate directly through the maxillofrontal duct. The ethmoidal cells drain into the infundibulum and thence into the antral cavity.

10. The blood supply comes mainly from the infraorbital and alveolar arteries; both of which are branches of the internal maxillary.

11. Enervation is by the fifth cranial nerve. Through the speno-palatine, ophthalmic and otic ganglia, Vidian nerve, Chorda tympani, etc., communication or anastomosis is established with the third, seventh and Glossopharyngeal nerves, etc.; also with the sympathetic system. Even nerves of special sense, such as the optic nerve, the neurilemma of which receives fibers from the spheno-palatine ganglion (Arnold and Longet as quoted by Cryer) are not immune.

12. From a study of these relations it is evident that pathological conditions affecting the antral cavity may involve the surrounding structures and through the lymph and blood streams the entire system.

a. Infections of the maxillary sinus may reach the ethmoidal, sphenoidal and frontal sinuses as well as the nasal cavity, and pharynx by continuity of tissue or through openings leading more or less directly from one to the other.

b. Chronic rhinitis and pharyngitis or both may be the direct result of a chronic sinusitis.

c. In nasal catarrh the seat of the trouble undoubtedly is always infection of one or more of the air cells.

d. Conditions obtaining in the sinuses may have a direct bearing upon hay fever.

e. Due to the complex communication between the various nerves of the parts, distant disturbances may arise as a result of pathological conditions obtaining in the sinus. Such disturbances may be within the eye, ear, nose, throat, tongue, face, scalp, etc. They may be sensory, motor, sympathetic or of the nerves of special sense.

13. The most rational and direct route to the antral cavity is through its anterior wall.

14. Principal structures to avoid in operations on antrum are nasal and orbital walls; infraorbital artery and nerve. Teeth should not be removed to establish drainage.

15. Diagnosis and treatment of diseases of the maxillary sinus and associated parts should be referred to those specializing in that field.

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DISCUSSION

Rea Proctor McGee, Pittsburgh, Pennsylvania: I agree with Dr. Rasmussen that when the infundibulum opens into the maxillary sinus direct there may be infection from the frontal sinus, but so long as the infundibulum is normal, I do not agree with him. The maxillary sinus is the only one of the nasal sinuses whose normal opening is near the roof of the sinus and where the drainage would have to be upward. All the others open through the bottom. This simply means that drainage of the maxillary sinus is due to siphonage by the passage of inhaled and exhaled air through the nasal air-way. It would be impossible to introduce infection into the antrum that had already come down through infundibulum into the nose. You can't do it! If you have infection from the frontal sinus you will always have the opening from the infundibulum into the maxillary sinus direct; also you have infection through the blood stream, because the bacteria attacking the tissues of the nasal sinus would be much more likely to have the selective function of that bacteria operate upon the maxillary sinus than upon any other tissue. Consequently, Dr. Rosenow's conclusion upon the tendency of bacteria to select their place of action would hold good and is responsible for much of the infection that it was formerly believed was due to continuity of tissue.

The doctor spoke of the sinus being built when all the teeth are in place. That is true to a certain extent but I think he will agree with me that the maxillary sinus has never reached its completion until the death of the patient, because there is a constant thinning of the wall and a constant enlargement of the sinus as compared to the size of the maxilla; as the patient grows older the walls grow thinner and naturally harder. Another thing that we have in maxillary sinuses is the rather remarkable recovery of fractures. One would naturally think that after these thin walls are readjusted it would be more difficult to repair a fracture here than a fracture of the mandible, but it is much more easily done.

I remember seeing a case in which a New Zealand dentist operated on a patient for fractured jaw whose upper jaw had been pushed back an inch and one-eighth and he drew it out in about three months without an incision. So you see there is an opportunity of movement en-mass through the thin walls of the maxillary sinus.

Now, so far as choice of place for entering the maxillary sinus is concerned, I believe the doctor is right in his conclusion. I think there is nothing more undesirable than entering from the nose into the maxillary sinus for any purpose whatsoever, whether it be drainage or anything else. The entrance through the anterior wall is not only easier to make but will repair quickly; in nine months you will have a bony regeneration over the point of incision; you can see the entire sinus and if necessary you can easily open the ostium maxillare.

At this point canine fossa you can look in and see whether you have polypoid recurrence; sometimes they recur every three or four days; hemorrhages are occasionally difficult to control. Of course, ordinarily, hemorrhages are easy to control. The original incision which should be from the first molar tooth to the region of the lateral incisor should be made freely and always of sufficient length to stretch and show your opening without injuring your tissue.

The plan of irrigating the sinus through a very small opening with a trocar is all right in simple inflammation but where you have a polypoid degeneration it is not sufficient and you are only temporizing.

Speaking of fistulas, which were brought up by Dr. Tholen, my custom has been to make a radical operation, go through the anterior wall, expose your entire sinus, remove your polypi and then do this beautiful operation which the doctor has described, which is a very satisfactory method, which gives a really good result, but do not close one of those fistulas unless you are going to do the rest, and unless your rhinologist is going to do his work, because if you do close that fistula the pus has to go somewhere and it is better to let it drip out than to be retained.

Now, where you have maintained the opening through the operation that Dr. Rasmussen has so well described you will have, at times, difficulty in closing that opening, particularly, if you keep it open six months or so, and the easiest way to close that is to lift the mucoperiosteum clear around the opening and then when you bring it together you can get a larger approximating surface, and easy union.

Drain the sinus as you find it; do not go through the orbital plate or the side of the nose; when you go through your antral wall, make a very small hole; otherwise you are

liable to land in the sphenoidal sinus. It requires gentleness and care and knowledge of your anatomy.

Truman W. Brophy, Chicago, Illinois: One of the most important matters pertaining to antral infection is correct diagnosis. This has been ably covered by the essayist.

The course to pursue in treating an antrum in a state of acute infection differs greatly from the treatment of an antrum in a state of chronic infection, and we have to proceed according to the condition that we find. Opening into the antrum in acute cases is a very simple procedure. A small opening should be made in the canine fossa, penetrating the antrum, after which it should be flushed out with an antiseptic solution. If the ostium maxillare is closed because of adhesions, the natural opening may be re-established from within the antrum, when the fluid will pass into the nose and in that way remove the infectious contents of the cavity. We may by flushing the cavity once or twice in the incipiency of the disease, effect a cure, but if the disease has become chronic and extended over a period of several months, we have another condition.

In almost every one of these cases, as Dr. McGee has said, we have polypi which we must remove. To do this, penetrate the canine fossa, look into the cavity and see what the condition is, remove the polypi and pack the cavity. In a couple of days remove the packing, dry the cavity, illuminate it and make an ocular examination. In this way we can proceed intelligently and know the exact condition of the cavity. If we remove the nasoantral wall, together with a portion of the inferior turbinate, we often destroy this important septum and leave a permanent opening. What does an opening of this kind do? It leaves the antral cavity as a part of the nasal cavity—the antrum and nose practically become one and what is the result? The dirt and dust of the street pass through the nose into the antrum. It cannot be easily removed and the patient has a constant irritation.

I do not consider that the Denker operation should ever be done in any case, since it calls for unnecessary sacrifice of so much normal tissue. If we enter the canine fossa, we can pass an instrument into the antrum, thence through the ostium maxillare, dilate and open it and irrigate the parts. If a cavity has a natural opening or duct and, as a result of inflammation, adhesions close it, we would not make an artificial opening, but would dilate the closed passage and evacuate the fluid. The operator who removes the nasal wall leaves the patient in a condition that is never normal.

This question has been asked by several dentists: "When a pulpless tooth with a useful crown, without disease of the gingiva or alveolar processes or pericementum, except at the apex of the roots, is afflicted with a dentoalveolar abscess; and when the apices of the roots reach up almost, quite to or penetrate the antrum, the pus from which enters it—should we extract the tooth?" My answer is no; not a tooth that has a good crown. Loose, useless, diseased roots of teeth should be extracted.

I believe that a large majority of antrum infections come from dentoalveolar abscesses—some from the nose—by continuity of the mucous surfaces through the ostium maxillare. To treat empyema of the antrum wisely is to know how to make a diagnosis of teeth that are infected. To treat diseased tissue properly, we eliminate disease and leave everything that is normal, leaving the part operated on in just as nearly a normal condition as possible. If we do so, we can preserve the normal tissues and eliminate disease and in so doing we have accomplished the very best service possible to accomplish for the benefit of our patients.

Dr. Rasmussen (closing): Permit me to correct an impression which I fear went forth to some extent. While the discussion centered largely on treatment, *I did not discuss treatment in my paper.* I merely referred to the method and place of entry.

Some of you may be under the impression that I recommend draining the sinus beneath the inferior turbinate bone. *I do not!* Decidedly not. There is a place so much better, so much more accessible and where no important structures need be sacrificed or injured, viz: the canine fossa.

Dr. McGee seems to disagree with me on the question of infectious material from the frontal sinus reaching the maxillary sinus. However, I have shown you that the anatomy of the parts is such that it lends itself readily to carrying secretions from the frontal sinus directly to the ostium maxillare. Furthermore, clinical experience over a period of years has proven that in many cases of maxillary sinusitis the condition will not yield to treatment so long as there exists a similar condition of the frontal or ethmoidal sinuses of the same side and further that upon clearing up the infection in the frontal and ethmoidal, the maxillary sinus immediately clears up also.

The infundibulum being, as it is, a gutter, so to speak, on the nasal side of the nasoantral wall, leading directly from the frontal sinus, in many cases, to the ostium maxillare, as illustrated, thus when infectious material, from the frontal sinus drains into the upper end of the infundibulum, it will follow this

gutter to the ostium maxillare. There is no way to avoid this.

Once this infectious material lies at the opening to the maxillary sinus, what is to prevent it entering and in time causing a condition similar to that in the frontal sinus from whence it came? Dr. McGee maintains that it does not because of the syphon effect due to respiration.

There is, of course, a lowered air pressure within the nasal cavity during inspiration but to off-set this there is an increased air pressure within the nasal cavity during expiration. Thus we have an alternating increase and decrease of air pressure within the nasal cavity, so that what syphonage might result from the decreased pressure would be off-set by the increased pressure during expiration which would tend to force the secretions, lying at the ostium maxillare, into the antrum. In addition we have the sudden and greatly increased air pressure within the nasal cavity due to sneezing and the clearing of the nasal passage of accumulated mucus, etc.

I do not mean to say that infection of the maxillary sinus always follows such a condition of the frontal, for fortunately this is not the case. I am merely attempting to show that not only is there a possibility of this occurring but there is a probability and that clinical experience shows that it *does happen*. In my paper I considered the subject from the anatomical point of view.

When dealing with a diseased maxillary sinus the surgeon should always remember that there is a possibility of its being secondary to a similar condition of some of the other sinuses.

Dr. McGee seems to take issue with me as to the time of life when the maxillary sinus is complete, but evidently he has not read my paper carefully for in it I pointed out that "the resorption of the walls of the sinus continues even to old age, when all of the walls may become extremely thin." Therefore when he says that the sinus is complete at death, it is in absolute accord with what I stated in my paper.

I am glad Dr. Brophy saw fit to emphasize my statement that healthy teeth or teeth which under proper treatment can be made useful organs, should never be sacrificed for the purpose of gaining entrance to the antrum. The pendulum has swung from one extreme to the other in the matter of retaining teeth. I trust that it will soon swing back sufficiently so that a little more reason will be used before teeth are ruthlessly sacrificed. Fortunately not all have been carried off their feet by the radical propaganda for the wholesale removal of teeth.

Someone during the discussion suggested the advisability of surgically closing the opening to the sinus immediately, in those cases where no bone covers the end of a tooth root. I have no objections to that being done if there is no infection about the apex or within the sinus itself, but it has been my experience that in such cases the opening will close quickly without any surgical interference.

THE RELATION OF DIET TO THE TEETH FROM THE STANDPOINTS OF DEVELOPMENT AND PROPHYLAXIS

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(Read before the American Dental Association, Los Angeles, California, July 17-21, 1922)

IN PRESENTING this review upon diet and its importance to the growing child, I am submitting an abstract based upon the present theories in so far as they are accepted. The literature is replete with discarded hypotheses, and today there are reports of experimental data which need confirmation by other research workers before they can be adopted. The history of nutrition and of diet in general is a most interesting one, principally because of the fact that there have been so many changes and such radical reverses of thought in connection with the development of the subject.

One of the earlier classifications which according to some authorities, furnished the sole criterion for the availability and the utilization of food, was based upon its caloric value. It was sought to determine how many heat units a definite weight of a food stuff yields. In the development of this theory the human being was conceived merely as a power plant capable of developing energy, and those substances which were burned up more rapidly within the body furnished this energy with the greatest ease. These foods constituted, therefore, the most necessary and useful articles of diet. Many complicated experiments were performed with the object of determining the exact caloric value and the equivalent energy value of foods. With this exact knowledge at hand, extensive feeding experiments were next conducted in an effort to apply these new principles. Chemistry had already shown the physiologist that the human body consists of certain elements and groups of elements which are necessary for the maintenance of life, so that the first and most logical classification separated the *organic* food stuffs from the *inorganic* ones. Perhaps we do not ordinarily regard water as an inorganic food but one of the earlier experimenters in this field of work placed water in its true position when he said that all body cells are aquatic in their habits; they must live *constantly* in a fluid environment. When they become dry, they cease to function. It is because the system is constantly losing water through evaporation, respiration and excretion that we must replace it. There exists no storehouse for water in the body as there does for fat, proteid or carbohydrate. The human body contains more water than anything else so that the constant loss must always be replaced. With the other articles of diet the variation in the amount which may be present is sometimes of significance. For example, iodin may produce, under varying conditions, definite pathological

lesions, and yet the difference between the maximum and minimum amounts is almost infinitesimal; so small in fact, that for years the variation escaped the notice of the experimenters.

There is also a close *relationship* between the different mineral constituents in the body. It has been proved that the physiological action of soduim chloride is governed by two other chlorides, those of the potassium and calcium. When this ratio is disturbed faulty metabolism ensues. Similarly there is a delicate balance between phosphorus and calcium, and sodium and potassium. In France there is a tax upon salt and the government has shown that there is a larger consumption of salt in those communities where vegetables are more generally eaten, than in others where a meat diet is used. Vegetables contain slightly more potassium than the flesh foods, and the system, to compensate for the difference, demands more salt or sodium in order to maintain the physiological equilibrium between the two substances. On the other hand, the Nomad tribes of eastern Asia, who subsist entirely on a flesh diet do not eat salt at all. The differences in the amounts of these mineral constituents are proportionately negligible from one standpoint but are highly important when considered in connection with diets. The study of the utilization of minerals by the body, like the study of the action of iodin, is an example of the *significance* of details which at first appear to be trival and of little value.

Halliburton (1), has given an interesting talk upon the importance of the infinitely little. He prefaces his remarks by saying that during his earlier years he attended a meeting where the title of the speaker's paper was "Nothing." Later, another scientist spoke of the "Next-to-Nothing," and cited the telephone as a development in science of these "Next-to-Nothings." In discussing some of the modern aspects of physiology, Dr. Halliburton has been pleased to classify certain of these problems as involving a study of the infinitely little. By that is meant that there are many substances concerned in the regulation of the diet existing in such small amounts, that they require special training and apparatus to study and detect. It is evident that the quantity of a material in a given diet, with perhaps the exception of water, does not necessarily indicate its relative importance. These things which Dr. Halliburton describes as the infinitely little, bear a very intimate relation to the well-being and general health of the individual. The subject of nutrition is apparently one in which close attention to detail is perhaps more important than in other types of experimental work. It has for its object the identification and method of utilization of food. For it is not sufficient that a person in order to maintain health have a full meal; his meal must be one in which exists all the elements of diet in their proper proportions. We accept the fact that proteids, carbohydrates and fats are necessary elements for normal metabolism, and we know that a mixed diet is essential to this end, but the important question has been and today is: When is a mixed diet mixed? What constitutes a mixed diet, and what substances are essential for the full functioning of an organism?

The earlier experiments upon the caloric value of food stuffs, which have since been developed by Von Pirquet in his Nem system, indicated in a general way that the fats burn in the flame of carbohydrate. It was found that the fats require *additional* oxygen for combustion in the body, and that this extra amount is supplied through the oxidation of the carbohydrates. It next became of interest to prepare in the laboratory, a quantity of carbohydrates, fats, and proteids, which were chemically pure and

to determine what effects might result from feeding a series of animals with these purified materials. As a result of the feeding experiments, the animals died. Something had been eliminated in the purification of these substances which was necessary for the maintenance of life. Careful chemical research was necessary before the startling discovery could be explained. A thorough selection of all the proteids was made and from this selection individual ones purified. It was found that although they apparently consisted of the same chemical elements, that these elements were linked together in different ways, which resulted in variations in their biological reaction. Proteids may I recall, consist of the nitrogenous class of food stuffs which we eat in the form of meat, eggs, fish and certain vegetables. The earlier conception of the use of proteids was based upon the fact that they constituted an available supply of nitrogen, and that therefore, the need by the body for this element was met. Purified gelatin is a proteid, and as such contains nitrogen, but animals cannot live upon a diet made up of purified gelatin, carbohydrate and fat. The organic chemist helped solve the problem by demonstrating to the experimental physiologist that the proteid molecule consists of a series of groups called the amino-acids which are linked together chemically. This linking is perhaps analogous to the manner in which building stones are used in erecting a building, in that the building stones are placed side by side and cemented together with a little mortar. We may apply our analogy by conceiving the building stones of the proteid molecule to be groups which are called the amino-acids, and they are also cemented together chemically. There are eighteen different amino-acids, used by nature in building the proteid molecules, all of which have been identified, and in some cases synthesized, in the laboratory. Having prepared these substances in a pure state they were fed to the animals, and after an elaborate study of the subject, it was proved that certain of these amino-acids are primarily essential to life. If the proteid molecule does not contain certain of these amino-acids the life of the animal is jeopardized. So the next development in the study of dietetics was this, that proteids themselves are dissimilar not only chemically but they possess different dietetic properties, and must contain certain essential groups in order that the metabolism of the animal proceed normally.

Assistance is rendered the body in digesting its food by a group of substances derived from the ductless or endocrine glands. These substances have been called hormones or chemical messengers. They function, apparently, by being elaborated from these ductless glands and their presence in the blood stream at certain points in the circulation provides the necessary stimulus for the activation of the other glands concerned in digestion. They promote the assimilation of calcium and other inorganic salts; they control to a very definite degree the secretions of the pancreas, of the gall bladder, and of the succus entericus; they are intimately connected with the phenomena of reproduction. In fact it has been suggested that they are concerned in the action of our next group of food substances, the vitamins.

We can only define vitamins by saying that their absence in the diet may give rise to very definite diseases; for example, scurvy and beri-beri. We know that there are at least three different vitamins and that the continued lack of one, two, or three of these from the diet will result in the death of the animal. It is this work upon vitamins in which Percy R. Howe has been engaged in Boston. His experiments are extremely interesting to the dentist as well as to the physician

and physiologist. By alterations in diet he has been able to effect changes in bone growth. His experiments, as well as many others of a similar nature, indicate that vitamins play an important role in metabolism but on the other hand Halliburton (2), is of the opinion that some of the experimenters are a little too enthusiastic in ascribing to the vitamins the effects which they obtain. He calls attention to the fact that the building of the animal body is entirely analogous to the building of a hut; the hut may be built of planks, but the planks must be held together by nails. We cannot build a hut of planks alone or of nails alone, both must be used. So with vitamins; perhaps the vitamins represent the nails which serve to bind together such planks as proteids, carbohydrates, fats and minerals. Opinion then has changed from one which formerly emphasized the importance of calories. It is admitted that the true value of food does not lie entirely in the amount of heat units it contains. Now we find in addition that some of the enthusiasm, which prompted the earlier research workers to describe such extraordinary effects arising from the vitamin experiments, carried them a little too far, and the remarks of Halliburton and others indicate that there is developing a definite reaction against a too liberal interpretation of these results. It is hardly correct for the dietitian to recommend the eating of raw cabbage merely to increase the amount of vitamin intake. If raw cabbage is eaten, raw starch is eaten. Raw starch cannot be easily assimilated by the system; the starch granule must be cooked; so the system loses the starch as a food and in addition must exert an added effort in getting rid of the material through the alimentary canal. Since the study of vitamins has become so intensive, the experimenters have found occasion to criticize the manner in which food is prepared for the table. The vitamins are affected by heat and in some cases are destroyed. There is an interesting point here in so far as the modification of milk for the infant is concerned. Our great grandfathers believed that all milk should be boiled. It used to be impossible to get an American, an Irishman or an Englishman for that matter, to drink raw milk, so they either worked it up into cheese, or else boiled it. Later it was proved that when milk is boiled some of its constituents are altered chemically; for example, the proteid portion of the milk is changed and therefore rendered less digestible when boiled. As a result, it is more difficult for the body to absorb the lime salts which always occur in combination with the casein. Consequently its effect upon the system is different from the effect produced by clean, raw milk. All of these facts emphasize the necessity for the use of certified milk. By controlling the sanitary conditions of milk production one is assured of a clean, healthy pure food but it must be placed upon a more economical basis before its use can become universal. When milk is pasteurized or sterilized the process merely serves as an excuse to market a dirty product, a product which contains an excess amount of filth. It is recognized that certified milk for the infant who has been weaned is perhaps the best food which can be given. All of these things are well known not only by dietitians but by the public in general, and yet neither dietitians nor public apply them. When a child specialist permits candy in excess between meals, or a parent makes a practice of giving sweets to children, they overlook not only an important dental problem but also an important diet problem. The stomach needs rest just the same as any other organ of the body. It should not be made to work over time. Before we leave this discussion of dairy products I want to mention one word about butter. Good butter

made from unpasteurized cream is of immeasurable benefit to the diet. Today the cream for butter making is pasteurized. The family churn has been taken over by the commercial butter maker and the butter we buy contains just as much water and salt and coloring matter as the manufacturer chooses to put in. In the earlier days we did not pasteurize our cream before we worked it up in the butter, but the exigencies of transportation, in addition to a perversion of taste have made these things possible.

Our modern civilization has imposed upon us, as individuals, certain habits of taste which within the next fifty years will probably be changed. These are the use of patent flour, fine white sugar, and other foods which have been purified "too pure." When patent flour is milled to the state of refinement as it is today, we lose not only its vitamins but also its equally necessary mineral salts. Similarly we are losing in the preparation of sugar, certain elements which are as important to us, as those that have already been mentioned. In applying these data to adolescents our concern is not that they should merely have enough to eat, but that the selection of the proper food in the correct amount is equally important.

This is of significance when we consider our own problems in dentistry. Although some historians have attempted to prove that the diseases of dental caries and "pyorrhea" (so called) were as common in the earlier days of civilization as they are today, it would seem that these conclusions might be subject to revision when one ponders the fact that only a relatively small number of skulls have shown evidences of these lesions. Colyer (3), has recently observed that from over three thousand teeth examined by him taken from skulls found in an old cemetery, only ten per cent showed any signs of caries, and they did not fill many teeth in the seventeenth and eighteenth centuries. Perhaps we may be able in the near future to show that dental caries and pyorrhea are not merely local diseases but that they are the result of a diet improperly chosen—one which consists of elements subjected to too much purification in our modern food factories. We cannot even speculate at this time upon the outcome of the present research upon nutrition. In nearly every civilized country in the world there is at least one laboratory, and in some cases hundreds, which are devoting enormous energy and expense to the study of this problem. The subject matter presented is disputed first by one group and then verified by a second. In this we find hope that soon the few salient facts will be well crystallized and presented to the public at large. There is no doubt at least of one fact, namely that rickets and poor teeth are concomitant conditions. Perhaps our modern diet is too near the border line of the minimum nutritional requirement, and as a consequence there are statistics to show that nearly one hundred per cent of the American people need dental service. It has seemed to me that the dental profession is treating effects rather than causes. It remains for the physiologist, for the biochemist, for the physician and for the dentist to combine their efforts in combating, or rather, in preventing dental disease.

When the idea of prophylaxis first originated in the medical profession, there was fear in the hearts of many that some of them would not have quite enough to do. It is possible that this same fear has stirred the hearts of some of the dentists when we talk today of prophylaxis and its relation to dentistry. The medical men have not starved yet as result of prophylaxis nor will they in the future. Neither will the dentist.

In conclusion then, may I point out that if normal metabolism is to be main-

tained, a well balanced diet is necessary. Lack of discrimination in the selection of food is the fault of the parent. Proteids, carbohydrates, and fats should be given in the correct proportions, and they should be prepared correctly for the table. It must be remembered that there exists in all natural foods definite substances which possess greater dietetic value than others, and the need for these by the growing child as well as by the adult is manifested by both clinical and laboratory experiences. The dentist should be able to place himself in a position to aid the physician in instructing the patient concerning the elements of nutrition so that the coming generations will not suffer through the ignorance or indifference of the parent, or of the oversight of the professional advisor.

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Discussion

Percy R. Howe, Boston, Massachusetts: Dr. Marshall spoke of a number of things which might be applied to other subjects as well as that of metabolism. For instance, he spoke of the changing views in the field of metabolism. That is so. There have been very radical changes in views in the field of metabolism and, also, in the theories of dentistry. Today, we are looking away more and more from the mere cleaning of teeth and the mere plugging of teeth. We are looking more at the fundamental cause. In spite of all our efforts to repair and in spite of the numbers engaged in cleaning the teeth the extent of decay is probably greater than ever before, it is at least the most common single pathological condition. So I think that we can see the importance of getting as clear an idea as we possibly can of the processes of metabolism in order that we may successfully combat these conditions.

During the formative period of children's teeth, even during pregnancy, the mother should be so fed that the youngster's bones and teeth develop properly. Now, in the motherhood period it has been the tendency to recommend foods in various popular books which make for an easy child birth. Such a procedure is detrimental to the child. What we want is good, bony structure and good, sound teeth. There are some things that stand out clearly: One is the fact that races that live on natural food are practically free from decay, while in civilized communities, decay is very common. We also see that when our modern foods creep into the camp of primitive races, decay of the teeth begins. We see many immigrants coming to our shores with excellent teeth, and, after they have been here a while we know what will happen. It has been a common thought among dentists that a tooth once formed cannot change. However, that is not a fact; for during pregnancy we know teeth change. The mother should be supplied with an ample supply of calcium in utilizable form, together with those food substances which will augment the use of the calcium by the system.

It has been found that proteins, fats, carbohydrates and inorganic salts alone do not supply the needs of the animal organism but there are other elements essential to life, growth and reproduction. The taking out of those elements from the food has resulted in physical deterioration and death. There are undoubtedly countless substances in food about which we know nothing, but it does seem, from such work as I have been doing, that at least one group of those substances is necessary for the proper utilization of calcium. In the feeding of infants and young growing children I am inclined particularly to recommend food containing calcium. Human milk is meant for human beings. Cow's milk is meant for calves and, when it is necessary to change the child over from the mother's milk to cow's milk, that milk has to be modified. Cow's milk curdles quicker and in that process of curd formation the lime is encased and is excreted. Also, there is something in citrus fruit and green, raw foods, in which the American diet is apt to be deficient, and those substances, when removed from an animal, in spite of the fact that you supply him with all the other elements cause his teeth and bones to deteriorate. So I think we need to advocate the use of citrus fruits and of green, raw foods to a greater extent than we have been doing.

The pasteurization of milk today kills the factor known as the anti-scorbutic vitamin. It has become common practice in nearly all institutions where they are rearing babies to

give either orange juice or tomato juice along with the milk. This shows that at the time when the teeth are forming there is particular need for green, raw food.

Disturbances in the endocrine glands, like tooth decay, occur in civilized communities and according to authorities they are very common. When we feed animals on such diet as I have mentioned giving everything except raw, green food, they cease to reproduce. The thyroid gland begins to atrophy, and it seems to me we need to go back and inquire what causes this condition. I believe that the character of our food has a great deal to do with it.

Haidee Weeks Guthrie, New Orleans, Louisiana: In an asylum in 1916, in New Orleans, we had a serious condition of ulcerative stomatitis. Eighteen children there were suffering with this condition which looked like noma. This ulcerative stomatitis followed the months of November and December, during which months the children lacked rich milk and balanced diet that they were provided with at other times. In five of these cases we had to do extensive operative work on account of the ravages of the disease and some of the children scarcely had any superior maxillary and few teeth remaining. We have put in prophylactic measures in the asylum and a balanced diet and, since then, we have never had an epidemic.

Dr. Marshall (Closing): This subject of nutrition is getting to the point now where bacteriology was in the time of Pasteur. We have been surfeited with bacteria. It has been thrown at us during our student days—bacteria, sterility, asepsis.

We have been overlooking, perhaps, other factors in the etiology of disease. There is a certain amount of energy which must be taken into the human machine, before it can function properly, or protect itself with a natural resistance to disease. So big a man as Karl F. Meyer of the Hooper Foundation has said, in discussing one of the diseases of mal-nutrition, that as late as 1913 we find scurvy described as an infectious disease. Every antiseptic was recommended for the treatment of it, and the list of organisms which were assumed to be responsible was equally as large. So we have, then, this condition, perhaps one of over-emphasis in the past upon bacteriology. In the next few years, knowledge of metabolism and of nutrition, will be so increased, that we will emphasize and recognize more clearly the factors which influence the development of natural resistance.

Dr. Howe spoke of the difference between cow's milk and human milk. Of course, those who have ever had to prepare the bottle for the baby will realize how much milk sugar is added to the cow's milk. We know that cow's milk is deficient in carbohydrates and therefore it is necessary to add more carbohydrates to it in order that it may approximate more closely, human milk. In speaking of the difference between cow's milk and human milk, imagine for a moment the difference in the life habits of a two-hour old calf and a two-hour old baby. Inside of a few hours after birth the calf runs around. The food of the calf, naturally, is of such a nature as to give him the energy necessary for this muscular labor. The food of the infant is designed along a little different line. There is a difference also in the fat content of the two milks.

THE RELATION BETWEEN DENTAL CONDITIONS AND THE HEALTH AND DEVELOPMENT OF CHILDREN

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(Read before the American Dental Association, Los Angeles, California, July 17-21, 1922)

THE forty odd years of belief in and application of the fermentative theory of the etiology of caries has failed to reduce the incidence of decay among the civilized people of the world. The forty odd thousand of practitioners of dentistry are today failing to reduce the number of persons suffering from this condition. This is said with a full appreciation of the wonderful advances and accomplishments which have been made along surgical and mechanical lines. These practices and advancements while comprising nearly all of the modern dentistry as taught and practiced, do not in any way deal directly with the actual cause of prevention of dental caries.

Dentists appear by their exclusive interest in reparative dentistry to believe entirely in the theory that good teeth or teeth capable of giving thorough mastication to food were not only fundamentally necessary but actually the only essential to health, apparently overlooking entirely the probability of the reverse being true; that health or good nutrition is capable of and does originally determine the development of normal teeth.

The consequence of this erroneous estimate of the situation has resulted in the very highly developed inlay, crown and bridgework and dental surgery, all of which is strictly reparative both in its relation to the individual for whom the work is done or for its results so far as the next generation is concerned.

Modern dentistry with all of the advances in art and science is still distinctly a reparative process which utterly fails even to produce an influence toward providing the new generation with normally developed and functioning teeth.

Dentists have taken up the idea and the phrase "preventive dentistry" and applied it to nearly every reparative operation performed by them, failing to appreciate that any of these things at best only and in a slight degree prevent further complications. In medicine "prevention" means to avoid the occurrence of a disease, not to cure it, even if by its cure the individual is left as sound as if he had not endured the disease, consequently it seems logical to assert the necessity for other measures than those provided by the art of modern dentistry to provide the civilized races with sound teeth or to develop real preventive dentistry.

This situation of adhering to the reparative art is not to be wondered at since the members of the profession by their dental education and training are not fitted to do anything else and acting in too perfect harmony, train the next

professional generation in the same way. So it is that the few who now and then have advocated either a different training for the student or a different theory of the etiology of caries have not found their ideas very generally received.

The idea of a systemic cause for decay of teeth is however quite old, and the early conception of the cause of dental disease is along this line. Hippocrates taught that stagnation of depraved juices in the jaws and teeth aggravated by an accumulation of food debris was the active cause. Galen, that tooth diseases were the result of vicious humors of the blood produced by disturbances of nutrition; while Hunter claimed that internal inflammation not external influences was the cause of tooth decay (1). It is however only within a year or two that any real serious thought and credence has been given to the theory that the general health or systemic condition may play a very important part in the development of the teeth. It is quite probable that the present prevalence of caries may not be due entirely to diet but to an aggravation of several complex conditions, all tending towards a lessened resistance to constitutional disorders. The diathesis of dental caries or the particular condition or habit of the body predisposing to this disease is probably of complex origin.

But why has it been so difficult to believe in the theory of systemic influence? Are not the teeth developed and maintained as an organ of the body? Why should not such organs partake of the health or lack of health of the general system? It is probable that all will agree that because histologically the passage of nutrient material into the enamel has not been satisfactorily demonstrated is one of the principal reasons for non-acceptance, while another reason may be that so far nothing sufficiently definite has been proposed to prevent caries. Also perhaps it may be that because teeth are removable as a minor operation, both physicians and dentists have considered them somewhat foreign and dis-associated with the body, so far as partaking of its nutrition is concerned.

Many things have been suggested in the nature of prophylaxis, prominent among which are scientific tooth cleaning and polishing, cauterization and filling of initial or formative cavities and polishing of approximal surfaces; all of these procedures have been in use at the Forsythe Dental Infirmary and with good results. But while these things are of much benefit in the individual case they are not preventive in the true meaning of the term.

It has been generally conceded that the condition of the teeth of an individual is responsible or contributory in a large measure for the general health, whether this be by aiding mastication or by eliminating foci of infection. This is undoubtedly true of both adults and children. Sutton reports in regard to 200,000 children examined by the Australian School Medical Officers that the worst teeth were found among the poorly nourished and the best among those exceptionally "fit" that caries should be considered contributory rather than a chief factor causing malnutrition (2).

There can be no doubt that dental troubles affect the health of a child, either as cavities in causing pain, preventing proper mastication, and by nervous reflexes or focal infection, retard its growth and development and have a direct influence on its physical welfare, mental development and school progress. The repair or extraction of troublesome teeth will undoubtedly greatly assist in improving the child's physical and mental condition (even to making dull and quiet children the "cut-ups" of the class). The record of one group of children, an open-air class in Boston, demonstrates this very well. Practically all dental work was completed in or before the fourth grade and from this time on

there was a marked decrease in all contagious diseases and in the percentage of malnutrition. We must however remember that the hygiene of the open-air class can not fail to contribute very largely to the result.

The situation in regard to caries is not due in all probability to inherited defects, it having developed during the last four or five generations; consequently it must be due to a change of environment, which is the only change of the last few generations; the food and the manner of eating it being the only ones suggested (3).

Yet should we consider these tooth conditions fundamental or secondary? It is probable that both the poor health and the poor teeth were occasioned by the same cause, but that artificially providing good teeth by extraction or repair gave sufficient stimulus in the way of more nourishment and by eliminating nervous reflexes permitted of an improved general systemic condition. This is frequently true even when the child is left with a much reduced masticating apparatus, the relief from the strain being sufficient to permit of a rapid improvement in nutrition. And while a complete and full set of normal teeth is an extremely desirable and necessary organ for any child to possess, it may be suggested that many children whose teeth are in a poor condition would be vastly better off with half as many which were in a good condition. In other words the surgical cleaning up by extraction of all badly decayed teeth is usually of much benefit to the child where such teeth cannot be filled for one reason or another.

Much has been said and written as to the harmful effects of decayed teeth especially in children, their effect on school progress and on the general physical and mental development, and while it is believed that this condition and its effects have not been exaggerated, it is not my purpose to enlarge further upon this phase, as it is sufficiently well understood. The necessity however for definite relief from this condition is of such importance and the plans heretofore employed produce such little improvement for the expenditure of time and money and even then give such slight benefit except to a few individuals, that it appears necessary to look to some other means to accomplish the result.

It has even been suggested that measured in terms of diseases of childhood, dental clinics have not yet justified their existence. It is claimed further that at least two complaints (scarlet fever and measles have a greater effect in producing caries than its absence would in reducing the incidence of these complaints. The reason for these conclusions is partly due to the fact that childhood diseases are "cyclic" and must be regarded as covering a longer period than dental clinics have been in existence (3).

On the other hand it has been found in England that school medical service treating minor ailments has been instrumental in reducing diseases including a reduction in pharyngeal and dental defects. This improved condition is also found in most localities in this country following the results of school medical inspection but to a lesser degree, as the treatment given is more limited, although most school medical inspection reports show a decided decrease in cases of malnutrition during the last few years (4). An improvement along these lines has been noted at the Forsyth Infirmary in the medical clinics in regard to the condition of post-operative adenoid and tonsil cases. The percentage of cases gaining normal weight following this operation and the elimination of tooth troubles have been considerably increased by attendance at these clinics. The actual medical treatment is limited in scope but suitable hygienic and dietetic instructions are given applying to each particular

case. While this work has not been carried on for a sufficiently long time or with numbers large enough to form any definite conclusion as to the effect on teeth, it is safe to suggest that definite improvement will follow this course of treatment. This is along lines similar to the recently proposed theory of measures applicable to the prevention of rickets (5), namely, maintaining the mother's health and efficiency, regulation of hygienic conditions in the home and regulating the child's diet along physiological lines. Without knowing definitely and completely the etiology of rickets, except as to its relation to the lack of a certain vitamin, it is now claimed to be a preventable disease by the above measures and it is not improbable or unreasonable to believe and apply similar measures to the prevention of dental caries, even if at present we cannot positively identify the actual cause or causes.

It is not my purpose to go into detail in regard to the various methods suggested to prevent tooth decay, such as tooth brushing, cleaning and polishing, the use of antiseptic and fruit acid washes and of hard and fibrous foods, the latter eaten especially with which to end the meal. These are among the most helpful adjuncts and undoubtedly assist teeth of poor quality and low resistance, but even then they must be considered only as beneficial aids rather than exerting any real preventive action.

It was found early in the Forsyth Dental Infirmary work there was very little good resulting in children coming for treatment, especially of the sixth year molars, after these teeth were badly involved, compared to the benefits resulting from early attention to these same teeth. Likewise it is of relatively little value and not at all "preventive" to attempt to develop normal teeth by cleaning, fillings or the use of mouth washes.

The surgical removal of an infected finger may be necessary in a given case, yet no one would consider, should this condition become prevalent, that such a procedure was a preventive one, except to prevent further extension of the infection. Consequently we must find some other means of giving sound teeth to the children than by filling and extracting them.

We must go back of the time the child's teeth are formed and make operative measures of some nature, which will affect the formation and calcification of his teeth. This rules out all of the usual so-called dental "preventive" procedures and even the dentist himself as now trained, for the formation of the teeth take place prenatally and principally during the first two years of childhood.

This general situation is well recognized by those who are working on the problem either clinically or in the laboratory. Whether teeth of poor quality and form result from the poor functioning of the endocrine glands, directly, or indirectly, unsuitable hygienic conditions including air and sunshine, unbalanced or deficient dietary conditions, including insufficient caloric intake as well as lack of the right amounts of the vitamins or dietary essentials, the right combinations of all of these things or of some not yet understood condition, has not yet been definitely determined.

Much interest has been shown during the last two or three years in the part possibly played by the dietary essentials especially as reported by McCollum (6), Howe (7), and more recently by Grieves (1); also pertaining to the effect of the thyroid gland in determining calcium metabolism as suggested by Broderick (8).

I shall not attempt to go into the subject except to make a few brief references to the more recent reports and to state that recognizing the great probability of dietary influence on the development of normal teeth, medical clinics (pediatric) have been in operation at the Forsyth

Dental Infirmary during the past two years as well as the extension of the research work along these lines by Dr. Howe. In addition to this, observations have been made and are being continued in several prenatal clinics, and with school children in relation to certain phases of this dental problem.

These observations with children show first that there are at the present time those whose teeth are normally formed and completely covered with enamel, even to the bottom of the sulci of molars and bicuspids; that strong and well developed jaws with wide arches are in evidence in certain localities and with a fairly constant definiteness. Also that these conditions exist in spite of little or no care in regard to brushing or other artificial means of cleaning, the only attention given to this feature being the unintentional one of habitually ending the meals with a salad or fruit.

CHARTS SHOWN AT FORSYTH DENTAL INFIRMARY EXHIBIT[1]

Chart (a) Fourteen month check-up of 162 Italian immigrant children average age 12 years. Seventy per cent originally (1st examination) good; of these only two per cent showed deterioration.

Chart (c) Fifteen Italian children average age fifteen years, born in Italy. Lived in America ten years. Seventy-three per cent still have good teeth.

Chart (d) Fifty children, fifteen nationalities, average age twelve years, fifty-four per cent had good teeth, only four per cent poor; balance, fair. Physical defect slight, twenty per cent.

Chart (e) sixty-three Italian children, average age twelve years, arrived 1921-22. Eighty-eight per cent had good teeth, one per cent poor. Balance fair. Physical defects twelve per cent; (corresponds to percentage of poor teeth.)

Chart (f) Twenty-five Italian children, average age of twelve and one-half years, American born, ninety-six per cent with tooth defects.

Chart (g) Forty-eight Italian children, average age six and one-half years, American born forty-two, two with good teeth; Italian-born, six with perfect teeth; eighty per cent with tooth defects.

The question as to whether these good teeth can withstand a strictly American diet has not been definitely determined, although the best as shown (only in a small group of fifteen, seventy-three per cent remaining good, stand up well under the semi-American dietary of the Italian after the lapse of eight to fifteen years.

This condition of normal development and uniform enamel formation would appear to bear out the suggestion made by Mellanby (9) and others that the lack of certain factors during the prenatal period and early childhood is fraught with serious consequences, the contention being that the younger the animal, the more of the various vitamins are needed. Drummond suggests that the storage of the fat soluble factor is of considerable importance to the pregnant and nursing mother, as it enables her to provide a high concentration of this factor without depending upon an external supply. The importance of this cannot be overestimated, for a deficiency of this vitamin is more serious and far reaching occurring in early life; particularly during the period when the young animal is entirely dependent upon its mother and on account of the rapid growth which takes place before birth and during the first two years of post-natal life, this

[1]At the Exhibit of the Forsyth Dental Infirmary at the Los Angeles meeting, charts and photos were displayed, showing children with good teeth and nutrition vs poor teeth and malnutrition.

is of especial importance (15). Also during this period a deficiency of water-soluble B leads to a cessation of growth and muscular incoordination, the lack of it being quickly noted, as the mother has little, if any, reserve supply available in her own tissues.

Jones, in a very comprehensive article on the Diathesis of Dental Caries (10) in referring to the developmental or systemic effect on the incidence of this condition says that welfare work in connection with expectant and nursing mothers has become a most important and successful measure of social reform and has been an active means towards reducing the percentage of defective teeth. In further support of the developmental theory of the cause of dental caries he states that this defect is often symmetrical, corresponding surfaces being attacked at the same time on the right and left side. This condition is corroborated by comparison of the teeth of twins who almost invariably show a definite similarity. In addition, it is most unusual for one twin to show any tendency to decay when the other is free from it.

The health of the expectant mother, especially at about the sixteenth to twentieth week, would appear to be of the greatest importance in terms of nutrition, especially as it may relate to calcium metabolism. Also the present knowledge of accessory food factors in the relation to scurvy suggests that the fat-soluble A and water-soluble B are indispensable to the growth and nutrition of the dental organs.

It has been thought that lack of breast feeding is responsible for the failure of good teeth development. While no one can overlook the bad results usually following artificial feeding of infants, it has been shown that unless the mother's milk is free from harmful ingredients and the mother herself in good health, the result of breast feeding may be harmful rather than beneficial. In this lack of health of the mother, carious and abscessed teeth naturally play an important part. Good breast milk free from any toxins elaborated in the mother's system is undoubtedly a prime factor in determining the general health and development of the child. Any abnormal condition of the milk may easily be determined by analysis, as shown by Talbot (11). Normal breast milk from a mother on a suitable diet, including the necessary quality and quantity of food not excluding the dietary essentials and minerals, contains anti-scorbutic and anti-rhachitic properties not so fully found in any substitute and confers on the infant at least a partial immunity to infectious diseases. It is not unreasonable to think that associated with these "anti" properties, may be a beneficial one acting favorably upon the formation and calcification of the teeth.

The proportion of normally formed teeth at eruption, including the sulci, which later succumb to caries, is extremely small and can in nearly every instance be attributed to some very definite upset of the economy, whereas the teeth erupting with even minute defects readily and rapidly progress to extensive decay, except in very rare instances where perhaps on account of some reverse systemic condition the process is entirely stopped.

While I have examined the teeth of a considerable number of children and have records of a variety of dietaries, I feel that there is not yet sufficient knowledge or evidence to enable us to state that any one thing is responsible positively or negatively for dental caries.

I am not at all certain that sugar unless taken between meals to destroy the appetite or in excessive amounts sufficient to over-saturate the fluids, has any appreciable effect. Those races who eat hard and natural foods certainly develop the jaws and almost invariably have wide arches and strong normal teeth. This is

due probably as much to the lack of degermination and demineralization of the hard or "whole" food as to its consistency. If in addition, their custom is to finish their meals without starchy or farinaceous foods but with fibrous or firm articles of diet, there is more reason to expect teeth free from decay. McCollum states that the American dietary is just enough deficient to keep the average person on a plane a little below the optimum, so that only a slight variation or an unusual strain on the system is sufficient to cause a deficiency. Whereas if a diet is so made up that there is always a surplus those slight variations have practically no effect (12). A somewhat similar condition is described by Zilva and Wells, to the effect that the mildest degree of scurvy detectable only at post mortem, produced well defined changes in teeth structure of animals (13). Hess states that there is much prevalence of a sub-acute or latent scurvy which while not sufficiently definite to be classed as an actual disease, nevertheless produces a very appreciable effect on the system. Also that the teeth are one of, if not the first, organ to be affected by a deficiency in the system (17).

A suggestion made by the late Dr. Bogue to the effect that dental caries should be considered a symptom of a condition rather than as a primary disease may be worthy of some consideration in the light of our present slightly increased knowledge of this condition. The fact that caries is almost invariably accompanied by other symptoms of development or nutritional disturbances should be considered. Whether or not we regard the original condition producing caries, scurvy or rickets as the disease or merely as the etiological factor is of little consequence, but it may be that when these factors are known their occurrence will be considered a definite pathological condition. The inclusion of the reference to scurvy and rickets with caries is not intended to suggest necessarily any dental association or similarity but merely to indicate a somewhat similar obscurity of etiology.

Shipley, Park & McCollum, in an article on "Experimental Rickets" (14) suggest that the artificial conditions under which civilization exists stands in an etiological relation to rickets. In this connection may we not assume that the existence of dental caries as well as of scurvy or rickets is a reliable indicator of a child's health so far as a subnormal condition of nutrition is concerned.

Dental caries is usually considered to be a childhood disease and it certainly is more prevalent during this period, but it is probable that this may be due to the fact that teeth erupting with structural defect of necessity succumb to decay within relatively a few years, depending on the extent of the defect and of the general resistance of the system. This usually results in the loss through caries or extraction of practically all of the weak members, with the exception possibly of a few hypoplastic teeth and those where decay is arrested. The teeth therefore which last until adult or later life are those which were originally normal or whose defects have been remedied by fillings. Really nothing more than "the survival of the fittest," which in this case means the survival of teeth normally developed during the embryonic period and the first two years of childhood. Consequently it might be better to call dental caries a prenatal and infantile disease which is unrecognizable at this stage but which manifests itself later during childhood, finally largely eliminating itself through lack of suitable material. In this connection it has been said that eighty per cent of the teeth which are extracted are those which have been given the benefit of dental treatment.

Dr. Drummond has said that the real criterion of good nutrition is the resistance to disease (15). Therefore even

if we are not at present able to demonstrate a condition of malnutrition in a child who shows evidences of dental caries, rickets or scurvy, this condition may be taken as prima facie evidence that the child either is or has been in a state of subnormal nutrition sufficiently severe to cause the conditions which are then in evidence. Hess states that deficiencies must be enforced for two or three generations to produce rickets by artificial means, principally by the lack of fat-soluble A and calcium. This may be equally true in regard to caries although there is at present no definite knowledge of this fact.

Summary

1. Modern dentistry failing to decrease the incidence to dental caries, the necessity arises to put into action under the direction of those trained along medical (pediatric) lines other measures looking toward the prevention of this condition.

2. Teeth are essential to good health only in a secondary degree, they having originally been the direct result of good or poor nutrition. The lack of teeth is of less importance than the possession of decayed and abscessed teeth.

3. The teeth may be considered as much an organ of the body as the eye and in the same way subject to changes in its nutrition; especially during the period of development. Caries may be regarded a symptom as are other conditions resulting from poor nutrition.

4. Causes of dental caries other than dietary have not been sufficiently substantiated, while changes in food and the manner of eating it have been the most prominent factors which have undergone change in civilized countries during the last four or five generations.

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MUSCULAR INFLUENCE IN RELATION TO PROSTHESIS WITH EXERCISES TO DEVELOP AND RESTORE PHYSIOLOGICAL MUSCLE FUNCTION

By FRED W. ALLEN, D.M.D., Boston, Massachusetts

(Read before the American Dental Association, Los Angeles, California, July 17-21, 1922)

THE significance of the normal posture and the importance that it plays in the preservation of health needs no emphasis at this time, certainly to the medical profession and hardly to the people in general."

The above statement was made by E. G. Brackett, of Boston, chief of the department of Orthopedic Surgery in the United States Army during the war. Yet, we as dentists have not awakened to the self-evident fact that one part of the human anatomy cannot be out of structural balance without disturbing the functioning of its associated parts.

I refer to the position of the mandible. The muscles of the jaw, face and neck function as a collective mechanism, and there can be no change in one that is not correlated with changes in the others.

To George Monson (1) of St. Paul belongs the credit of first bringing our attention to this subject. He says: "Clinically, we find patients with loss of facial dimension because the mandible is too close to the maxilla, due to improperly constructed dentures, wear on natural teeth, or any other reason. The shortening of this osseous framework naturally shortens the distance between the origin and insertion of the masticatory muscles, causing a decrease in the muscle pull and consequently the throwing out of balance of muscle activity. This loss of balance in muscle activity and closing of the bite is the prime factor in producing the backward movement of the condyle, which then encroaches upon the external auditory meatus, and often causes a resultant defect in hearing in a degree proportionate to the amount of encroachment."

Other observers are verifying his findings. Walter Wright (5) in 1920, coined the phrase: "Traumatic Deafness." Forrest Orton (2) contributes the following: "It seems reasonable to say that the functional activities of the neck structures will doubtless be somewhat impaired by any decided change from their normal position. The area required by the tongue in the act of deglutition, together with the proper drainage of the mouth, which is always an accompaniment of the act of swallowing must result in retention and stagnation of saliva about the necks of the teeth. And it is a well-known clinical fact, that cervical and senile decay about the necks of the teeth is most frequently found in middle life, at a time when a wearing down of the teeth is also most frequent. These facts would seem to justify us in including the maintenance of the mandible in normal relations with surrounding structures, as among the important functions of occlusion."

The orthodontist has long recognized

the improved physical and mental development from treatment of malocclusion, but the idea that the same principles could be applied to adult

Fig. 1

cases seems never to have occurred to us, and I wish to direct your attention to two additional important functions, i.e. circulation and respiration, depending upon structural balance of the muscles of the neck, especially those at-

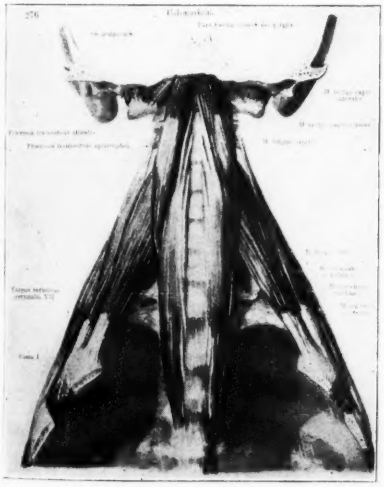

Fig. 2

tached directly and indirectly to the mandible.

Figure 1 shows the front and side views of the skeleton, the skull resting upon an articulated column and held in place by guy ropes of muscles, the first two ribs, clavicle and scapula acting as the base.

Figure 2 is an anterior view showing deep muscles, the longus colli and capitis with the three scaleni attached to the first two ribs, the latter functioning in forced inspiration.

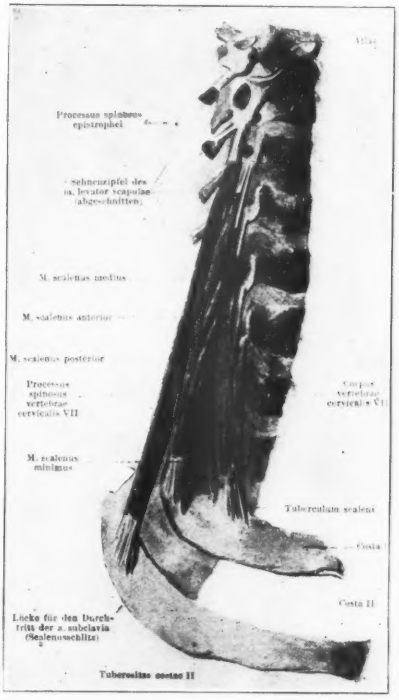

Fig. 3

Figure 3 shows a side view of the three scaleni.

Figure 4 is a side and back view showing complexus splenius, levator anguli scapulae in addition to those mentioned before.

Figure 5 shows the complex arrangement of the muscles of the front of the neck.

Figure 6 gives a deeper view showing clearly the relation of these muscles to the hyoid bone and mandible, particu-

Fig. 4

larly the four infrahyoids which function in the act of deglutition, the omohyoid, by carrying the hyoid bone back-

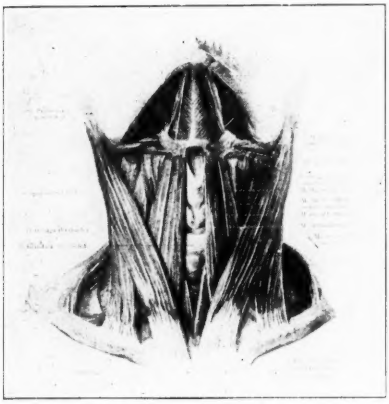

Fig. 5

ward and sidewise, contributes to the act of sucking, thereby draining the mouth of stagnant saliva.

Figure 7, a side and front view of the neck shows the truss-like arrangement of muscles attached to mandible,

Fig. 6

depending upon its position for their proper tension and function, especially

Fig. 7

the omohyoid with its fascia slip attached to the first rib and clavicle. Also the carotid artery, jugular vein and

phrenic nerve. This is the nerve supply to the diaphram and constriction of the neck muscles creating pressure on this

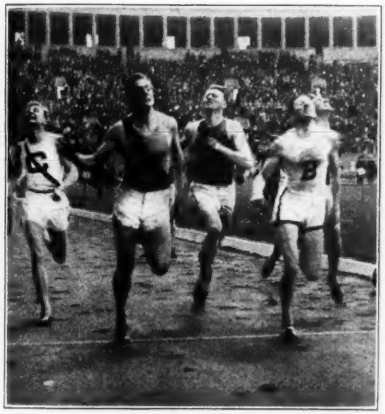

Fig. 8

nerve may cause a tense diaphram with shortened breath and hysteria.

Figure 8. This picture, by the courtesy of the *Boston Herald,* shows the finish of a race recently held at Harvard Stadium. Note the thrust forward position of the mandible tensing the omohyoidei, for by rendering the lower part of the cervical fascia tense, they lessen the inward suction of the soft parts, which would otherwise compress the great vessels and the apices of the lungs.

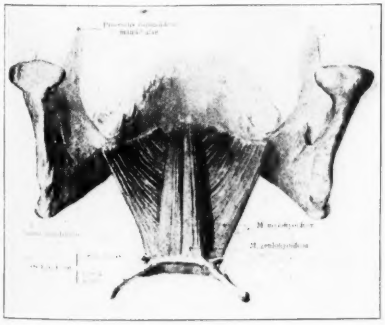

Fig. 9

Figure 9 is a back view of mandible with mylohyoid and geniohyoid supporting hyoid bone.

Figure 10 is a side view of same, showing suspension of trachea to mandible.

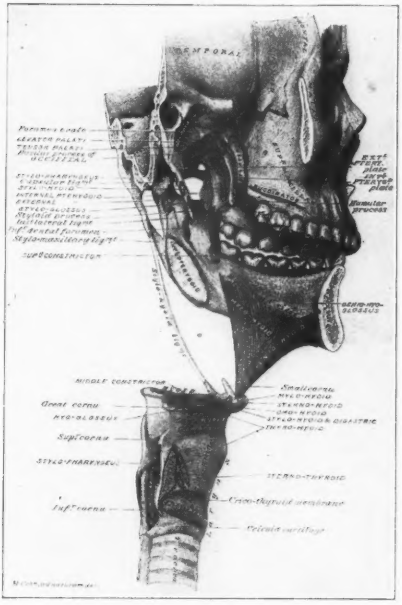

Fig. 10

Figure 11 shows a side view of constrictor muscles, the middle and superior depending upon mandible for proper tension.

Figure 12 shows a lateral view of tongue and suspending muscles. The retrusive position of mandible permitting lost tension and congestion.

Circulation

The degree of health of any part of the body is relative to proper circulation

of the blood. The arterial flow is by strong rapid pulsations and may be fairly constant, but its return by the veins is comparatively even and sluggish with no pulsations, and may easily be disturbed by constriction of the surrounding tissue. Although the walls of both arteries and veins have the three coats, the veins are unlike the arteries, having a thinner weak middle muscular

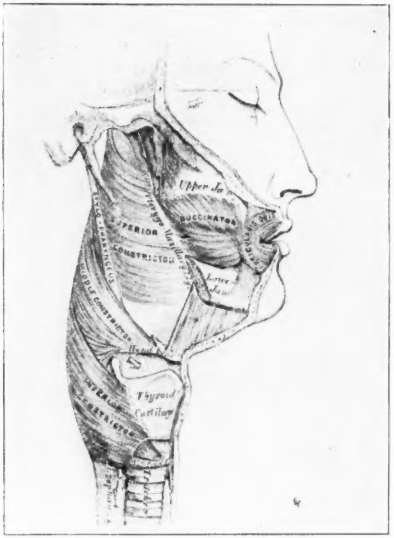

Fig. 11

coat and readily collapse. Nature has made a wise provision for this condition by doubling the area of the venous circulation. "Between venous sinuses of the cranium and between veins of the neck where obstruction would be attended with imminent danger to the cerebral venous system, large and frequent anastomoses are found."

Figure 13 shows pterygoideus plexus which lies between the temporal and the external pterygoid, and partly between the two pterygoids.

Figure 14 shows the internal jugular vein. A flabby condition of muscular

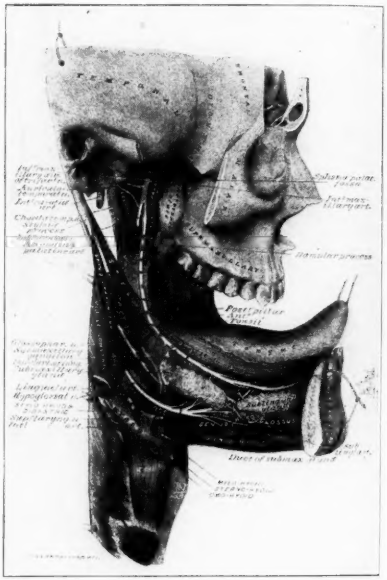

Fig. 12

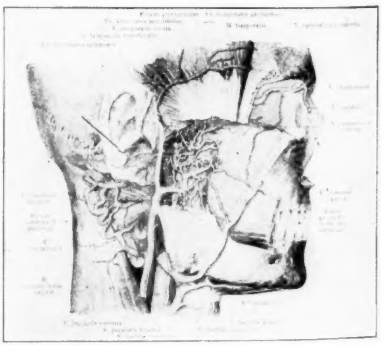

Fig. 13

structure surrounding it, causes congestion and may contribute to sleeplessness, headaches, ringing in the ears, conges-

tion of the throat, partial closing of eustachian tube, thereby disturbing air balance of the ear.

The Lymphatic System

Figure 15. In all muscular action there is waste and repair. Waste being eliminated by the intricate lymphatic system whose thin transparent walls require proper muscle tone to prevent

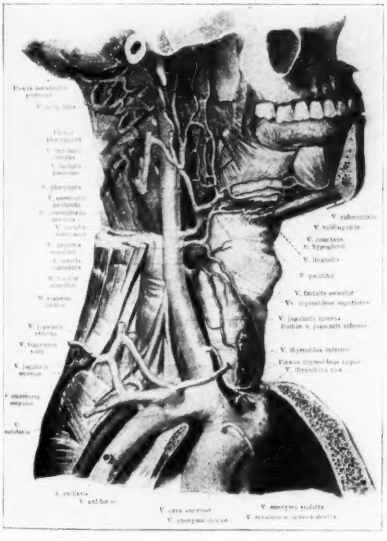

Fig. 14

compression and obstruction of this waste.

Facial Harmony

Figure 16, a diagramatic drawing by Dr. Monson showing the difference between normal facial harmony and one where occlusal balance is altered by loss of teeth, abrasion or lack of osseous development. "Evidence of the mandible being too close to the maxilla is the pronounced increase in the lines and ridges upon the face. The ala of the nose is raised and the point of the nose is lowered by a crowding or pushing up of the tissues of the face; the base of the nose and the mouth are broadened

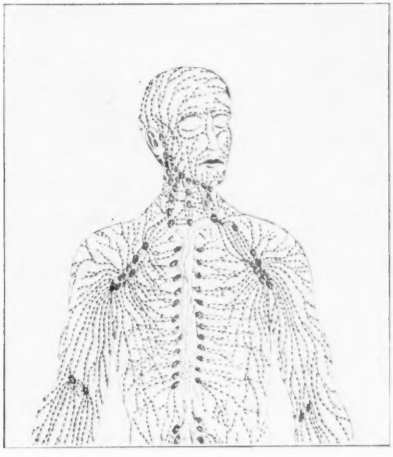

Fig. 15

and the angle formed by the base of the nose and upper lip increases as well as the angle between the lower lip and

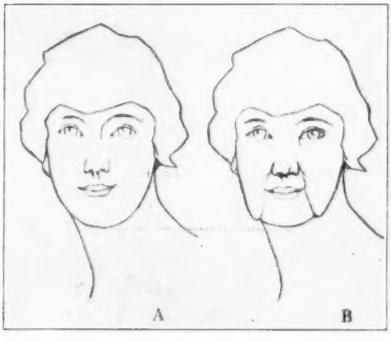

Fig. 16

chin. The apparent dropping of certain facial tissues, such as that of the cheek in forming the so-called chops, is in fact the result of the closing up of

the mandible, leaving the cheek tissue pendant. The facial tissue in the median line is pushed up and the cheek

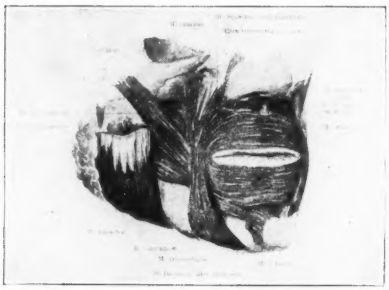

Fig. 17

tissue hangs pendant, thus producing three distinct diagonal ridges, one from

Fig. 18

the bridge of the nose, blending into the cheek, one just below the ala of the nose continuous with the upper lip and cheek, and one from the angle of the mouth continuous with the lower lip."

Figure 17 shows zygomaticus and

Fig. 19

buccinator muscles, also levator labii superioris and depressor anguli oris.

Fig. 20

When these muscles are shortened, the lines from nose to chin are formed.

Figure 18 is a larger view of the face showing in addition the lavator labii superioris alaegue nasi which is divided

into two slips, one attached to the ala of the nose, the other to the upper lip. This muscle when shortened, raises the ala of the nose and causes the line from the bridge of the nose noticed particularly in edentulous cases.

Muscles of Mastication

There are four chief muscles whose function is mastication, temporal, masseter, internal and external pterygoid. Figure 19 shows the temporal and masseter. Note the broad area of origin of the temporal and the bulk of the masseter. These two muscles, assisted by the internal pterygoid, are capable when in proper degree of tonicity, of exerting great force in closing the mandible against the maxilla. Figure 20 shows rear view of the two pterygoid and Figure 21 shows lateral view. The external pterygoid assisted by the internal, opens the mouth and protrudes the mandible. Functioning alternately in conjunction with temporal and masseter, they perform the act of trituration.

Principles of Restoration and Exercises to Develop and Restore Physiological Muscle Function.

The first principle is the establishment of cusp relations and arch form by mechanical means, upon an engineering basis which permits of normal functioning of the jaws and teeth. The second is the restoration of normal muscle tone by stimulation of the natural functions of these muscles, for "it avails us little if we diligently seek to place one part of the human machine in harmonious relation, and neglect that other part upon which permanent success depends."

The Pterygoid Exercise

These muscles control the position of the mandible, and if it acquires the habit of retrusion from whatever cause, they grow weak and flabby and help keep it there. Sitting or standing erect with head tilted back, thrust the mandible forward counting five slowly, then relax, count five and repeat. Do this five times, five times a day. In some cases it may be increased to ten times, eight or ten times a day. This exercise also gives tone to the platysma myoides, a most important muscle in expression.

It also tenses the omohyoidei and if a deep inhalation is taken during protrusion, the first two ribs are raised and the apices of the lungs filled.

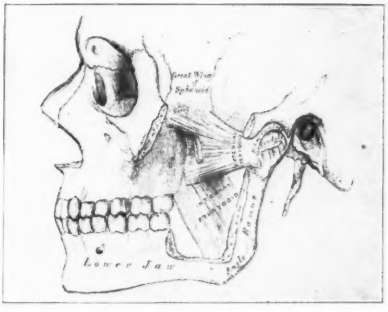

Fig. 21

The Temporal Masseter Exercise

If the extent of restoration is not too great to bring undue stress upon the abutment teeth, this exercise may be executed with the jaws in central occlusion. Place the fingers upon the masseter at the angle of the jaw, alternately contracting and relaxing, counting as in the previous exercise. Do not do it spasmodically, but rhythmically as each contraction and relaxation must be complete. If the bite has been well opened, or the abutments too weak to endure the previous exercise, the resistance of fingers may be used.

With the tips of the fingers upon the lower teeth, the nails resting against the upper teeth, the exercise is performed as before. This brings the maximum of

contractile effort with the posterior teeth slightly apart avoiding the traumatic stress which would otherwise occur.

The Orbicularis Oris Exercise

This exercise is chiefly one to restore tone to the muscles of expression. Practically all of these muscles are in some way attached to the orbicularis oris, and it shares with them their loose flabby condition. With the thumb and finger inserted within the corners of the mouth, contract the lips against the pressure of the fingers. Great care must be taken not to stretch the lips, as it is sometimes surprising to find how little contractile power some patients have.

Tonic Exercise

This exercise is for general facial development. Dissolving a little bicarbonate of soda or salt in as warm water as is comfortable to the tissues of the mouth the patient is instructed to take a dessert spoonful and with great energy, the teeth firmly closed, force the liquid from the lingual cavity into the buccal and back again repeating several times. This should be performed after each meal. This exercise also gives action to the muscles of the tongue and throat.

In addition to the normal blood supply to a muscle in function, the warmth of the liquid brings an extra amount, thereby, greatly aiding the restoration of normal muscle tone. By these exercises, the muscles quickly develop new habits, and in the phraseology of the psychologist: "Habit first reduces and then eliminates the attention with which acts are performed."

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WHAT RULES SHOULD, IN GENERAL, GOVERN IN DECIDING WHAT TEETH SHOULD, AND WHAT SHOULD NOT BE ROOT-FILLED?

By CLARENCE J. GRIEVES, A.M., D.D.S., Baltimore, Maryland

(Read before the American Dental Association, Los Angeles, California, July 17-21, 1922)

PRIOR to the introduction of accurate radiography and its general acceptance as a dependable diagnostic and operative adjunct, the most casual review of dental literature will show that it was generally believed that all dentists could and should fill the root canals of all pulpless teeth.

The skillful and conscientious dentist of that period no more doubted his ability to fill apices and to cure abscesses on such teeth than he questioned his fine technic in the closure of caval walls of coronal cavities by fine gold foil operations.

With the exception of fractured teeth, or those hopelessly involved by pyorrhea, all pulpless teeth, save those most patently necrotic and abscessed, were apparently conserved and certainly retained in function by the prevailing methods.

We were equally confident of other major steps in root-filling operations; our skill was not to be questioned in the proper devitalization and removal of dental pulps; and no one doubted the potency of medicaments, applied in root canals, to sterilize the lumen and adjacent tissues, as well as to cure alveolar abscesses.

When popular methods failed it was said to be due to the personal equation and to arise from a lack of skill or care in the individual.

But accurate radiography soon demonstrated that complete foraminal filling, comparable to closure in caval fillings, was the exception rather than the rule. As the result of their studies, histologists explained that rarely had the entire pulp been removed and that many teeth were devitalized by the use of chemicals applied for pulp devitalization only, and intended for tooth preservation, not destruction.

Further, bacteriologists insisted that none of the trusted medicaments sterilized canal dentin, to say nothing of adjacent soft tissues, which were likewise often necrosed in the effort to destroy bacteria. Thus it appeared that not one of the important phases of this operation, in the conservative principles of which the dental profession took such pride, had been successfully consummated, save by chance.

Through the intelligent interpretation of radiographic evidence, associated with the known history of patient and tooth, we were destined for other unwelcome revelations. Our complacency was again disturbed by the pathologist, who explained from his studies that a large percentage of the apices of pulpless teeth,

treated by these methods, were involved by abscesses of two types: First, the exudative, purulent, fistulous form, with which we were familiar, and had assumed that we cured; and second, the non-exudative, non-fistulous, granulating-cystic, blind type, of which, histologically, we knew little or nothing.

We were further disillusioned by the statement that, with all of our treatment of the fistulous type, comparatively few abscesses had actually been cured; while in the blind or granulomatous type abscess only the cystic phase had been recognized and removed by surgery.

Again success in treatment was proven the exception rather than the rule. This exigent period in the history of our profession was further complicated by the conception, new to medicine, of the focal infection theory as the cause of systemic disease.

Portals of entry for pathogenic microorganisms, were said to exist in tonsils, paranasal sinuses; the gastro-intestinal and genito-urinary tracts, which eventually became foci, the infective or toxic products of which finally involved other organs and the body generally in grave systemic disease, usually of the chronic type.

The pulpless tooth, known to be interstitially infected was *per se* immediately indicted as a virulent primary focus, together with associated gingival and apical diseases, which were said to rank among the most potent of all infective foci.

Of all of these, the granulating blind type abscess, of which so little was known, was claimed to be the most prevalent and most focally dangerous. When the history of this era in dentistry is written it will be said, perhaps, that this was the most disheartening period for all honest men during a long record of conscientious service to humanity, the main effort of which was to conserve, and not destroy, oral organs and tissues.

That the master minds of our profession acknowledged and accepted the situation without cavil, is to their great credit; and it is with no small pride that we record the fact, that after fifteen years every step in this exceedingly difficult operation has been so reorganized and corrected as to satisfy the most meticulously inclined histologist or bacteriologist.

Due to the efforts of such men as Callahan, Rhein, Ottolengui, Best, Arthur, Black, Coolidge, Hinman, Johnston, and others, the boasted technic of our profession again has not failed us, and, it is now possible to actually accomplish that which we were misled into believing had been done before. We may now very conservatively reach the following conclusions:

Conclusion I. All dentists may and can treat and fill the canals of all pulpless teeth by modern technic, if they will but take the time. Modern technic defines the dental pulp to be removed as all that tissue bounded by odontoblasts and dentin. This is now removed surgically, leaving the vessels in the immediate foraminal openings in reparative touch with the blood stream, with little resort to strong chemicals which are so apt to destroy subapical tissues.

The modernized type of canal filling now practiced may be defined as extending into, but not through the foramina, with no open canal beyond it and no apical protrusion of the filling. All this has been accomplished in spite of the fact of the coincident discovery of multiple foramina and many complicated diverticula in dental pulps, heretofore unsuspected. The strictly technical and surgical requirements have been thus fulfilled and a pulpless tooth, even if in-

terstitially infected, may be root-filled and so thoroughly sealed away from vascular contact as to be no longer considered, in itself, a focal factor.

Such pulpless teeth may be retained in function for years and are innocuous as far as health is concerned, provided they are not previously involved by gingival and apical disease. Having demonstrated that all such apices *can* be filled, the question as to what type of tooth *should* be root-filled must be answered.

This immediately raises the questions, is root-filling a process, curative of apically diseased pulpless teeth? Can gingival and apical disease be cured, and may teeth then be retained in physiological cell contact with investing tissues, and in full function, and still not create foci which may be a menace to health?

This must be answered to the satisfaction of the pathologist, who has confirmed our error in the retention of diseased teeth. As individual pathologists we must recognize that amelioration of symptoms is not a cure of disease. There can be no compromise in this matter. We must recognize a cure of local disease as only that orderly and regular repair and organization of cells, comparable radiographically and clinically, to normal adjacent tissues, which are in full function.

As the result of our treatment there must no longer exist doubtful or remaining areas of lowered local resistance, which may at any time become foci and involve the patient systemically.

It is obvious folly to risk the patient's health and operator's time in experimental canal treatments, that teeth may be retained which are surrounded by tissues that remain, locally and focally, pathologic or pathogenic.

Leaving the matter of gingival involvement of pulpless teeth to those of this symposium better able to discuss it, we hesitate to invade another section; which will ably define such teeth as are salvable; however, some definition of the histopathology involved is necessary if teeth which *are* to be root-filled, are to be distinguished from those *not* to be filled, but extracted. The following conclusions are the result of a study of a mass of data and references:

Conclusion II. Whatever the result of canal treatment, root-filling is a preventive and not a curative process; the most exact foraminal closure will not cure apical abscess but is all important in preventing it and its recurrence.

Apical lesions may be classified, broadly, as (a) periodontitis, which at any time may proliferate; (b) open, exudative, fistulous; and (c) closed, granulating, cystic, types of abscess. These may assume acute, subacute, or chronic phases. Local oral conditions, such as the occlusion and gingival attachments, and the general condition and resistance of the patient should be considered before instituting continued root-filling.

Apical periodontitis may be accepted as the primary phase; the periodontium is infiltrated and extravasates are produced by infection from the foramina, septic pulp, and infected apical cementum; if absorption or drainage results the apical insertion of the fibers is not detached, the cementum is not denuded, and recovery is possible.

Conclusion III. If modern canal methods can be applied promptly, apices involved by periodontitis should, at the proper time, be root-filled to prevent more serious stages of apical disease.

If the periodontitis becomes chronic and proliferates, the cemental insertions of the fibers are destroyed and replaced by infected granulations to a periapical line, defining the dento-cemental communication. If liquefaction results, the

outer cemental lamellus becomes infected and denuded, and physiologic cell contact is questionable.

Conclusion IV. If proliferating periodontitis has not become chronic, modern canal treatment and root-filling methods may prevent apical abscess and permit retention of the tooth.

Without too great detail, it can be said that a fairly accurate knowledge of the stages described may be obtained by a close orientation of the symptoms and clinical findings with repeated accurate radiographs.

Conclusion V. Denudation of apical cementum marks the line of distinction between curable and incurable apical disease. If the denudation is permanent and the areas infected are saturated with exudates, or surrounded by abnormal granulations, it is questionable if the tooth should be retained, or root-filled, unless apicoectomy is to be attempted. The outcome of this operation is exceedingly doubtful and it must still be classed as experimental.

Acute periodontitis may become subacute and proliferate, ending in granulomatous apical disease; or it may result in acute exudative fistulous types, with much tissue liquefaction; just as the local and general resistance of the patient meets the pathogenesis, virulent or avirulent, of the invading microorganisms.

Conclusion VI. In acute phases, if much oedema and exudates exist, particularly if they be purulent, rather than serofibrinous, prompt drainage and modern treatment may justify root-filling and retention of the tooth, with frequent clinical and radiographic survey.

Radiography of acute osseous lesions is generally vague and disappointing; it is only after the fourth day that definition and rarefaction occurs.

Conclusion VII. In subacute exudative abscesses, which are ill defined and still diffuse, showing comparatively large periapical areas, with a percentage of bleared trabeculae and slight outlines of the lamina, defining periodontal width. If these are associated with amelioration of the clinical symptoms, such apices should be filled experimentally; and the case frequently surveyed, for it is this type of apical abscess which may be considered hopefully, if we may judge by increasing percentage of cures.

But when the third, or chronic granulating stage of apical disease is well established with diffuse granulations, granulomata, or cysts, surrounded by a definite loss of tissue, or rarefaction, and a line of fibrosis and condensing osteitis, a diagnosis of a denuded, necrotic and infected apex is very positive. The apex may be palpable buccally, for it is floating in granulations, and is only attached by the middle and gingival third periodontium. Occasionally these attachments become almost synostosed by compensation, and the tooth is abnormally rigid. Rarely has this phase of closed granulomatous apical disease been proven to be cured.

Conclusion VIII. That in all stages of chronic granulating and cystic apical disease, apices should not be filled, unless apicoectomy is attempted. The tooth should be extracted because it constitutes a proliferating local pathologic process, which may at any time involve the adjacent teeth or induce systemic disease.

Conclusion IX. Only recently has there been established a technic which gives a promise of greater assurance of success in root-filling the open apices of childhood and adolescence, which in the past, were unfilled or overfilled. It should be practiced on all such cases that are not definitely abscessed, with the hope of correcting this early lesion which is the most prolific source of

chronic apical diseases, particularly those later in life involving the first permanent molars and maxillary lateral incisors.

The pulpless deciduous teeth, particularly the molars, the retention of which is so important in the prevention of future malocclusion, dental caries, and gingival disease, present a problem as yet unsolved, to the satisfaction of conservative operators.

Conclusion X. It is my opinion that exposure of vascular pulps in these teeth should be met by coronal pulp removal at least, but that no effort should be made to remove the immediate apical contents or fill the immediate apex.

It has been shown that radiography is of little use in the diagnosis of apical disease on deciduous teeth, and that the percentage of closed granulomatous abscesses is very small, if it exists at all, while fistulous, exudative, abscesses are clinically apparent.

Conclusion XI. It is therefore suggested that temporary teeth involved by persistently fistulous apical disease should *not* be root-filled, but extracted; and that all others, containing necrotic pulps, be treated and root-filled as much as possible.

The entire situation as to pulp removal, canal treatment, and root-filling, has so improved, that it bids fair to be one of the most hopeful things in the modernization of dentistry. When every man shall have patiently and honestly mastered the technic, and when a similar treatment can be found to cure apical disease, a solution not at all impossible, dentistry's answer to the oft repeated challenge of medicine will be complete, and there will be little apical local or focal disease to treat.

SOME OF OUR NEEDS IN PARTIAL DENTURE PROSTHESIS

BY F. E. ROACH, D.D.S., Chicago, Illinois

(Read before the American Dental Association, Los Angeles, California, July 17-21, 1922)

THE casting process, improved materials and equipment, coupled with a standardized technic have brought about a most satisfactory condition in the development of the practical side of removable partial denture prosthesis; and with some few definitions, a better classification and a more comprehensive terminology.

So far as I am personally concerned I am very well satisfied with the technic employed at present. This technic was given in a paper read before the partial denture section of the National Dental Association at Milwaukee, (1) last year, and it stands today an unchanged standardized technic. However, we are in great need of some scientific data on the following questions:

1. To what extent may we employ clasps in anchoring partial restorations?
2. How and to what extent can we enlarge the field for the clasp?
3. What are the comparative merits of the wrought and the cast clasp.
4. What are the comparative merits of the clasp and the manufactured attachments?
5. Does the cast clasp in any way interfere with normal tooth movement?
6. In what cases should the clasps carry the major part of the load?
7. In what cases should the mucosa bear the burden?
8. What is the prognosis in unilateral extension saddle cases?
9. To what extent should stress breakers be employed?
10. What are the indications for (a) the lingual bar, (b) the palatal bar instead of the arch type of partial plate?
11. Should the partial plate come in contact with the lingual surfaces of the natural teeth; if so, how much? If not where terminate?
12. Does plate or clasp cause abrasion of the surfaces of enamel with which they come into contact? If so, is it mechanical or chemical?
13. What are the governing factors determining the choice of (a) fixed bridges, (b) removable bridges, (c) partial plates?

The questions submitted above are among the many mooted questions in the minds of the majority of the profession today. May I submit for your consideration the following answers:

1. In almost all cases where repair of anchor teeth is not necessary.
2. By a better understanding of clasp design, construction, installation and maintenance.
3. The cast clasp being accurate, rigid and form fitting affords better anchorage and greater stability to appliance.
4. The fact that employment of the clasp does not require any material mutilation of the teeth gives it a decided advantage over the manufactured attachment in this respect. But in so

far as liability of decay, and in some cases appearances, the manufactured attachment is better than the clasp.

5. The cast clasp can in no possible way interfere with normal tooth movement, and on the other hand may be used to advantage in supporting and stabilizing the teeth to which they are attached.

6. In removable bridges where the span is not too great, teeth are strong and the bite is favorable.

7. In all extension saddle cases and other cases where fixed or removable bridge does not meet the requirement.

8. Where a firm, well defined fully absorbed ridge is present with two or more good sound teeth for anchorage, a short bite and normal occlusion when properly constructed the prognosis is good.

9. Practically the only occasion for the use of so-called stress breakers are those cases where the anchor teeth are badly off parallel. Their employment otherwise is an apology for inaccuracy of construction.

10. Where posterior teeth are out and anchorage is to be made to teeth back of the cuspids. The arch type would as a rule be employed in both upper and lower cases where only the six anterior teeth are present, or in bilateral, multiple space cases in which both posterior and anterior teeth are to be supplied.

11. As a rule the partial plate should either lap onto the lingual surfaces of the remaining natural teeth as far as the occlusion and other conditions will permit, or be terminated at least one-eighth of an inch away from the gingival margin.

12. Plate or clasp contact with the natural teeth does not cause mechanical abrasion of the enamel when properly designed and finished. The damage that occurs is more likely to be of a chemico-bacterial nature rather than mechanical.

13. Length of span, condition of teeth and the kind of patient are the principal factors governing the choice of a fixed or removable appliance.

It is also desirable that we have some classification of clasps and suitable names for them. We have a conglomeration of prefixes used to designate the different types such as band, ring, collar, half round wire, round wire, basket, crib, Bonwill, Roach, Nesbett, Jorden, etc.

Wm. E. Cummer (2) has recently given us rather an elaborate classification of clasps which in the main, seems very acceptable, but time does not permit the presentation of his classification.

There are a great many terms used promiscuously to designate certain types of appliances, or parts thereof, that are not in keeping with a scientific nomenclature, for example the names "horseshoe" plate, the "grasshopper" or "butterfly" connectors and "stress-breaker," etc.

We are in need of some definitions, classifications and terms that mean one and the same thing to all of us. There is a lot of confusion with reference to the names we give to some of these things. For example, we frequently hear the terms clamp, attachments, anchors, bands and rings used instead of the word clasp which I believe to be the correct term. We also hear the terms occlusal pads, stays, spurs, stops and lugs used instead of occlusal rests.

There is some considerable variation in the terms to designate a partial plate, such as partial denture, partial restoration, removable bridge, partial fixture, etc. In order to be specific we should use the term partial plate, or possibly coin some better term. While a partial plate is a partial denture, so also is a fixed bridge a partial denture, likewise a removable bridge is a partial denture.

Again we have many terms applied to upper partial plates in which the two sides are connected by a strip that

crosses the palate, such as overarch plates, overarch bars and palatal bars. For the lowers we hear the terms lower arch plates, lower bar plates, lingual bar plates.

I offer a few definitions—a simple classification of cases and a limited number of terms:

Partial denture prosthesis is the art of supplying artificial substitutes for the natural teeth in partially edentulous mouths.

A partial denture that is that form of restoration which supplies one or more artificial substitutes in the partially edentulous mouth and is divided into fixed and removable.

A fixed partial is that form of partial denture which is cemented to place in the mouth.

A removable partial is that form of partial denture which may be removed by the patient.

Fixed partials are divided into crowns and fixed bridges.

Removable partials are divided into removable bridges and partial plates.

A removable bridge may be defined as that form of removable partial artificial denture that occupies the space originally occupied by the natural teeth and their investing tissues and depends largely upon the natural teeth for support.

A partial plate is that form of removable partial artificial denture that occupies the space originally occupied by the natural teeth and their investing tissues, extends to other parts of the mouth and depends largely upon the mucosa for support.

Classification of cases may be made according to location of spaces where teeth have been lost, viz:—

Unilateral single space double abutment.

Unilateral multiple space with multiple abutment.

Unilateral extension saddle.

Simple bilateral.

Complex bilateral.

Bilateral extension saddle.

In addition to the above mentioned needs it is my opinion that the profession generally is very much in need of what might be termed Consulting Engineers. This to my mind while the most neglected, is one of the most important things in the accomplishment of satisfactory results. There are a great many men who are capable of doing good work if properly directed, but they have not the ability to design the appliance. To make the appliance that will be best suited to the case calls for not only the highest degree of workmanship, but requires a lot of experience and a creative mind to meet the great variety of cases successfully.

I have avoided going into details in order that my paper be short and to the point, and my purpose in making these suggestions is to call to your attention some of our needs with the hope that we may get these things into the hands of the proper committees for their consideration.

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KINDERGARTEN METHODS OF TEACHING ORAL HYGIENE

By MINNIE M. S. PROCTOR, D.D.S., Los Angeles, California

(Read before the American Dental Association, Los Angeles, California, July 17-21, 1922)

KINDERGARTEN methods of teaching oral hygiene bear a close relationship to dentistry for children. The dental profession needs kindergarten methods of teaching oral hygiene because it is turning to preventive dentistry in an effort to check the ravages of decay. Diet, prophylaxis and the newest phase of dentistry, pedodontia, or dentistry for children, are being given much attention.

Only recently, the radiograph exposed our faulty root-canal technic and showed us the many failures we had made in the treatment of pulpless teeth. These disclosures were quickly followed by wholesale extractions of teeth with very little to offer as substitutes. The inevitable reaction has taken place and the progressive dentist of today is turning to preventive dentistry. He is reading and teaching more about oral hygiene and diet with relation to tooth development and is making a more careful diagnosis.

It is strange that after all these years, dentistry for small children should be considered something new, but that very little thought has been given to the care of children's teeth is easily proved by the little that has ever been written upon this subject.

Why has the dental profession as a whole been so neglectful of this most important phase of dentistry? Perhaps, because operative dentistry for children, at best, presents many grave difficulties and the abundance of reparative work to be done for adults often seems more urgent and more lucrative.

Parents are already demanding better dentistry for their children and soon dentists will not dare to turn the little ones from their doors. What right has any dental surgeon to do so? What would be thought of a surgeon who would neglect an injury, only because the little one made it difficult to apply dressings? Many thought the great institutions built for and devoted to children's dental needs would solve this problem but some of these institutions have proved a disappointment to many because in the operatories very little permanent work for children has been done except with the forceps. The irreparable injury caused in that way is often only too permanent.

I believe the cause of this is that too few dental operators have been properly instructed to do operative work for young children.

I am pleased to learn that our own Dental College of Southern California has recently given special attention to children in the operatory. Let us hope that other dental schools will soon include pedodontia in their curriculum.

Parents should be educated in the dental office and from the lecture platform, to care for their children's teeth. It is true that children should receive dental care at pre-school age but the education given in the school room will do much to carry the message into the home.

That the laity does not understand the

serious injury caused by failure to care for the deciduous teeth I believe is largely due to the indifference of the dental profession, who fail to instruct them. Too often have dentists said, "Just let the little teeth alone for they will soon fall out." We, as a professional body, owe it to the children to correct the injustice done them by our old-fashioned brethren.

It is believed that the prevalence of dental caries is due largely to two causes; the neglect of oral hygiene and poor diet in relation to tooth development. Prenatal diet is also an important factor. Oral hygiene is given much less attention during childhood than later. Inquiry shows that even today comparatively few toothbrushes for children are sold.

To the dental profession belongs the grave responsibility of the dental education of our children, for from no other source can correct information on this subject be obtained. We have too few dentists to do the needed operative work, therefore it is difficult to spare any for this teaching, but we can educate the teachers who in turn teach the children.

The addition of oral hygienists as an auxiliary to our profession adds to each dentist the necessity of assuming the role of dental educator. These women are much needed as teachers in child welfare work, in teaching and demonstrating in school rooms, hospitals and other institutions. Of course, they will make mistakes, but we must remember the evolution of a new profession is in process and these women today are pioneers. That the greater number of the women assuming the responsibility of this work are young women with little previous experience of any kind but adds to our difficulties and makes it imperative that we give them the knowledge they need in a manner as simple and scientific as possible. If this is not done soon, I feel sure that much effort may prove futile. Whether we believe in the efficacy of the oral hygienist or not, the law says she is to assist us and it is our duty to help her to be of value.

We should assist in standardizing the teaching of oral hygiene. The adoption of a universal method of giving toothbrush drills with the recommendation of our national organization might be helpful to oral hygienists and other welfare workers.

It seems strange that anyone should require any other argument for a clean mouth than the satisfaction of having a clean mouth, but so long have the oral cavities of children been neglected that it will take many arguments and much patient work to overcome bad habits.

With the limited number of trained workers and the little written material upon the subject, oral hygiene cannot be taught in schools as other subjects are taught. The irregularity of the lessons makes it even more necessary to use unusual and impressive methods.

Literature on the subject of oral hygiene must meet the high scholastic requirement demanded by our public school system. To properly publish and broadcast this material is a big and expensive problem. Because of this, much of our educational dental literature has been left to the manufacturers of the advertising departments of various dentifrices.

I believe that many dentists well fitted to do this work, hesitate because they fear their efforts may be considered as a transgression of dental ethics. At present, it does seem to require courage to meet this phase of the problem.

Very little really good material for teaching kindergarten oral hygiene is yet available. I know but one little school *text-book*, it is called "Child's Book of the Teeth," by Dr. Ferguson. I think it deserves the support of the dental profession.

Let us put some of the scientific knowledge into language the little ones can understand. This is, at present, somewhat difficult to do because while the dental profession numbers many skilled craftsmen, too few are true educators.

As a member of the Los Angeles Pub-

lic School Health Staff, for many years, I saw an endless procession of little children with broken down, decayed and abcessing teeth. That experience makes me eager to enlist every dentist in this work for child welfare. It is the reason for the presentation of a little group of kindergarten stories and educational charts. They may suggest other ideas and help supply the need for this material.

These stories and charts are particularly useful in the many schoolrooms that do not have facilities for showing slides or moving pictures. Part of the group can be used in dental offices or from the lecture platform.

Group I. Suitable for children in the kindergartens and first grades; includes a short story in booklet form. Six year old Mary Jane falls asleep, leaning on her tea-table. She dreams that her teeth hop out of her mouth one by one and converse with her tiny white tea set. The little teeth complain bitterly of the way willful Mary Jane has neglected them, while the dishes boastfully tell of the careful attention they have received. The teeth have just decided to run away when the little girl awakens and declares she will never again neglect her teeth. She brushes them well, upstairs and downstairs, inside and outside and, of course, teacher can show in the toothbrush drill to follow, just how Mary Jane does it.

Two or three little dishes from Mary Jane's own tea set with little faces painted on them is a part of this group. These dishes excite much interest among the little tots, and will repay carrying them about. Of course, Mary Jane's small toothbrush in a neat case must accompany the set.

Group II. With but few changes, can be used in grades four to eight, the "D. Kay Brownies" in booklet form with a fascinating cover design. It tells the story of a row of little marble houses that were broken into by a robber band of mischievous brownies. Much interest can be aroused by making a guessing contest of this story with illustrations on the blackboard. What are the marble houses? Teeth, of course; and the robber band? Germs, of course! Thus the game goes on until the policeman with his stubbly beard is whisked out and the real lesson is given then, or promised for the future. A celluloid toothbrush case with a little policeman painted on the cover helps make the story effective.

Group III. A folding chart shows a molar in different stages of decay. This chart is useful in school room and on lecture platform for the simple anatomy of the tooth can be illustrated with its aid. A leaflet tells the story of the little mill. Each tooth is an important cog which forms a part of the perfect mill. How useless the little mill becomes if these cogs are allowed to be lost or broken.

Group IV. This mechanical chart with revolving feature will be found most useful for older children and in lectures to mothers' clubs. It illustrates the eruption of a permanent pre-molar and the expoliation of the deciduous tooth. many other points such as the development of the roots of the permanent teeth, function of the pulp, importance of correct contact points, etc., can be better shown with the aid of this chart.

In conclusion, I wish again to call your attention to the close relationship of pedodontia and oral hygiene. It is impossible to have a clean mouth and permit cavities to remain in the baby teeth. Good dentistry should mean that the entire masticatory apparatus should be restored to normal. Paliative treatment alone, should not be tolerated, but the most careful curative methods are worth very little if hygiene is not maintained. The value of mechanical cleansing of teeth by proper foods has much to do with maintenance of clean mouths.

To properly impress the laity with the importance of all this, forceful and simple methods of teaching oral hygiene constitute an important factor in solving a great problem.

PSYCHOLOGICAL AND PRACTICAL FACTORS IN ACCEPTING NEW PATIENTS

By ALBERT LELAND LeGRO, D.D.S., Detroit, Michigan

(Read before the Michigan State Dental Society, Detroit, Michigan, April 10-12, 1922)

IN TREATMENT of the practical and psychological factors used continually in a successful dental practice it becomes necessary to avoid theories, and be certain that the deductions made and observations propounded are the result of experience and careful observation. Let it be understood then that in the presentation of this subject, the paper will be confined to a description and analysis of such practical applications as have proven of value in acquiring and maintaining a really successful dental practice.

We have had so much propaganda during the past few years on increasing dental fees that it has left no small percentage of the dentists top-heavy in their lust for gold and a consequent underpinning in the way of ability, hardly keeping step with it.

Great respect by the patient for the professional man and his ability is the first requisite for good dental fees and this respect can only be acquired and maintained by careful, conscientious and painstaking effort on the part of the dentist to first possess himself of great ability, judgment, and confidence born of self analysis and continued endeavor to do each succeeding duty a bit better than the one before. First build up qualities such as ability, good financial habits, esteem of friends and neighbors, and that confidence so necessary in bringing your clients to understand you and your position, will automatically assert itself. Self analysis must be the determining factor in each operation, remembering that ability, judgment and confidence are the results of a determination to do only the best. Your idea and mine of what constitutes success may be at variance so we must get together on common ground, i. e. recognize certain principles as cardinal.

We will then assume that the professional man recognizes, if he is to be successful, the necessity of having health, education and ability, together with the confidence that must result from these three assets.

By confidence we do not mean the "cock-suredness" born of ego, but the state of mind characterized by reliance on one's real ability and accomplishments in his chosen profession; not effrontery, impudence and impertinence, but well merited faith in oneself. He must have the highly laudable ambition to excel and to conduct his practice without employing doubtful expedients to advance his interests.

How do you receive your client? A prospective patient presenting himself in your office for professional services should be met by your office assistant in all cases, if you have one. This woman

assistant should be trained to get certain information from the client in such a tactful manner, that no offense will be taken. Invariably the first question asked after the usual salutations is, "Have you an appointment with Dr.....?" On receiving a negative reply she immediately informs the client that the doctor is busy and she will proceed in a courteous manner to learn the patient's name and the very important item, the name of party or parties who so kindly referred them.

This information is imparted to the dentist at the time and he should decide whether he will see the patient at once or immediately following the work at hand. If the case is one that is not urgent, it is wise to make an appointment for examination and consultation. In a well regulated practice with office assistant it is deemed psychologically best for the operator to remain out of the reception room at all times during office hours. The assistant is the go-between and should transact all business outside of the operating room.

When a prospective patient refuses to give the name of the person who has referred them, it has been our experience that with but few exceptions, such a patient would prove a very undesirable patron. That sort of a person is of the type that attempts to domineer, demand more and is frequently easily dissatisfied. They are of the doubtful variety so far as credit is concerned and the dentist should have no hesitancy in dismissing such a person immediately and thus avoid future trouble.

If you do not employ a woman assistant it is advisable for the dentist himself to procure all the information here advised and to make appointment for careful examination, explaining to the patient the necessity of giving the diagnosis, the consideration that only more time will allow. Painstaking examination, careful diagnosis and conscientious prognosis are not the result of a few moments' survey with mouth mirror. This service, if rendered properly is the most valuable duty performed by the dentist, for upon it depends the success or failure of his work, the engineering problem itself and in reality should be the "blue-print" for the services to be rendered.

Consultation and examination should therefore have their rightful place in the minds of both the operator and the patient. Advice should be given in such a way that the patient recognizes its value and his obligation to the man who gives it.

A stamp of gravity and importance is given a special appointment for examination and consultation and unless the case is urgent or the patient has come from a distance, the special appointment for this purpose is strongly advised. A special hour each day for examination and consultation has proven, with me, a bad policy unless the hour was used for very superficial examinations and arrangements. During some of these hours, very little of the time was taken for what it was originally intended and on other occasions, so many patients presented for consultation that justice could be done to none. In addition it was soon evident that many patients found it convenient to call with real and fancied troubles, minor treatments and conversations, that were invariably unpaid for, and there was seemingly no way to enter them on the day-book for time consumed.

Since discarding the consultation hour and resorting to special appointments, every hour in the day is accounted for in the day-book. It has also allowed us to get all information such as financial habits and general trustworthiness of the patient before he comes again. By financial habits has meant not only the

ability to pay but what is even more important, disposition to pay.

The credit men divide people into two groups, the positive and the negative to which I add a group under the caption, neutral. The negative comprises that classification called dead beats and people with bad financial habits. The positive that classification which signifies established credit or good financial habits such as both ability and disposition to pay. It is not enough however that a prospective patient should be out of the negative class to qualify as a good patient, but he must also be firmly established in, and known as, a member of the positive class. All dead beats have a first victim and until then can only be classified as neutrals until their first offense when they become identified with the negative class, their very nature and lack of good financial habits having of course precluded their classification as positive.

After these observations we are then in a position to consider the questions: "How do you talk to your client?" and "What are the things you talk about?" Most patients during their first appointment are prone to talk much about themselves, their teeth and their former experiences. It is well to listen attentively to all of this, once, and then proceed to disregard most of it unless, in your mind, it has an important bearing upon the case.

If the patient comes with a tale of fault-finding in regard to the former dentist, you may rightfully view that patient with distrust. In my own practice, the patient would not be accepted. When a patient comes for the first appointment it is well to remember that they have been referred to you by some one who has much confidence in you. They have perhaps left the other fellow for one or more of many reasons, real or fancied and they have come to you, not because you have D.D.S. or M.D. attached to your name but because they are convinced before they arrive that you are the dentist to render them professional services. An impression and atmosphere has been created in the patient's mind before he has even seen you and it then becomes the difficult task for you to live up to it and prove yourself in reality the clever fellow they have pictured you.

If a patient has sought your services because of your personality alone; your ability to do well something outside your profession; your membership in some lodge or church, you are at a disadvantage for you have yet to prove yourself the big man in your profession and usually patients who arrive by these vehicles are much less satisfactory than those who have come for your dental ability and have been attracted by little else. This class then creates an atmosphere and when brought into an environment of dentistry such as an operating room, creates a relative condition that must be maintained. It therefore becomes necessary after the usual and necessary salutations, to talk dentistry and maintain that atmosphere at least until all final arrangements are made. The patient should be allowed to think of nothing else until all procedures are agreed upon between operator and patient.

In every case possible this should include the financial arrangements not approximately but exactly, particularly in cases involving considerable money. This naturally brings us to the questions: "How do you lead up to dental considerations?" "How do you talk dentistry to your client?" and "What is your manner of presentation," When these questions were first propounded it was thought advisable to treat them as personal questions but it is quite evident that what applies in one man's practice successfully cannot be literally applied in another and they are therefore an-

swered in a way that modifies though typifies my personal practice.

It is a very well known fact that patients who regard mouth conditions from a health standpoint, are most profoundly impressed with the gravity of the situation when the masticatory apparatus is considered and will absorb more educational propaganda on dentistry when treated from this standpoint.

We are given a doctor's degree. The word doctor means one who teaches, and we would betray the trust imposed on us by our alma mater if we did not at every opportunity, endeavor to teach our patients all that is good and helpful for them to know about dentistry and its advantages; what we have found bad and have discarded and what we believe to be good and are practicing. Fortified then with this high opinion the patient must have of us, at least when they first arrive, the dental environment and our determination to hold that atmosphere until all arrangements have finally been made, the case is then considered and talked of from a health standpoint.

Personally I do not believe that a dentist is giving all he can unless he reads from beginning to end, the four leading dental journals each month. See that these journals are mailed to your residence instead of your office and ten or fifteen minutes each day will finish all four each month and will not have interfered with other reading which in a way is just as essential as that pertaining to your profession. Patients often bring up some subject or procedure relative to dentistry and many dentists are unable to discuss it because they have failed to keep up in their reading.

The advantage of elaborate charts and models in diagnosing and describing the contemplated work is great indeed and enlists the profound attention of the patient at once. Diagnosis charts are carefully made and as carefully explained to the patient. Promises as to service, etc., are carefully avoided and discomforts are truthfully pictured when inquiry is made. The patients need reassurance and that is always furnished in the different ways that suggest themselves, care being taken to refrain from highly colored or untruthful descriptions of procedure.

During the examination and consultation appointment, especially if the patient is a new one and much of a fee is involved, let me remind you once more that it is exceedingly good business to consider and decide all financial arrangements connected with the fee. This precludes the necessity of discussing the subject at any subsequent time and all that remains necessary is to render the service that your patient has come for and expects.

To render a statement after the work is completed and much in excess of what the patient's mind is prepared for, is poor business and men who make this a practice are continually having trouble with their patients. These men do not receive the uniform good fees that the man enjoys who pursues the tactics. We would not want our wives to go into a store, select a beautiful fur and have it sent home without asking the price, yet many of us expect our patients to do just that when dentistry is considered. We should now have the unpleasant part of the contract behind us and we can proceed to get into the enjoyment of actually performing the operations we have arranged for and not worrying as to whether we are going to be well reimbursed for our efforts or not.

It perhaps will be said that the recommendations here set forth are not applicable to all practices. I maintain that they are and if applied as described here or in a modified form to meet certain conditions, by one who is in earnest, only success will result. The office assistant is often of great help in preparing the minds of new patients. The assist-

ant must be a woman who attends strictly to business at all times. She should never be called by her first name but always addressed as Miss Blank. It is possible for her to arrange with the prospective patient for the examination and consultation appointment, informing him at the same time that the doctor will give him the exact fee if they so desire which will include the fee for examination and consultation. In this way the patient is appraised of the fact that a fee for this particular service is always charged. The patient is then told in a very casual though courteous way that after this examination and estimate, if they then decide to give up having the work done as suggested by the doctor, he may pay the fee for consultation and examination and all arrangements will be discontinued without any feeling on our part. I might add that during the several years that we have pursued this policy, only two have failed to go through with the work at the time and one of them came back a year later.

The feeling that many men have that it is impossible to place a certain definite fee for professional services is erroneous and may largely be attributed to that common malady known as gelatinous spine. It is the man who lacks moral courage who gives an approximate fee and decides whether he will remain within it or exceed it if opportunity presents, by the manner in which the patient receives it. A definite fee though large and admitting of nothing but a good remuneration no matter what nature of work might arise, is much more honest than a smaller approximate fee that admits of so much elasticity and has a tendency to promote dishonesty. I cannot lay too much emphasis upon the necessity of making perfect study models to go hand in hand with elaborate charts. Articulated study models, carefully studied, are more essential than the finished work itself, for without the models, extensive repairs to maximum efficiency are impossible, even with the most beautifully executed work.

Study models and highly efficient work go hand in hand. It is surprising how expert one becomes in reading study models, how you learn to detect the result of one improper contour on a restoration disturbing the balance of a whole denture; what a terrible toll traumatic and malocclusion is taking every day; and how the tissues tally with the suggestions you receive from the radiograph.

Is it any wonder then that the dentist, fortified with all of these facts, waxes eloquent and with the greatest of ease educates the patient to better dentistry. These facts are the backbone of enthusiasm, success and courage in yourself. You radiate confidence and your patient takes more stock in you and is willing and glad to follow your suggestions on your own terms. Some men radiate failure and discouragement and I think it is due to the fact that they are not mentally, morally and physically equipped to overcome obstacles.

Therefore let me remind you once more that the mouth mirror survey alone is hardly the last word in diagnosis for a highly efficient and successful dental practice.

Learn to compute the cost of your different operations, make your fees large enough to at least give you an adequate income and in addition cover repair or do-over charges and have the courage to look your patient in the eye and tell them the worst.

Don't be afraid to lose a patient. Every patient I have ever lost has been replaced by a better one.

New business is the most remunerative so be sure that you render services so well that your patients will continue to praise your work and treatment of them whether they return to you or not. An old patient of yours makes a better patient for the next man and will invariably pay him larger fees willingly

than you received from them and so in turn, the new patient who comes to you and makes such a wonderful patient may have only been a fair one for his former dentist.

In making appointments for patients it is advisable, if you are a busy man, to learn what hour in the day is most convenient for the patient and if possible give them that same hour for all appointments with days as close together as possible. It is well not to start work involving much time on one case until one patient has been finished and dismissed. This method avoids much confusion and trouble and systematizes your work wonderfully.

In conclusion I want to say a few more words upon the financial side of dentistry. I was approached by a dentist the other day who suggested that I say something that would be of benefit to the man who is losing an unreasonable amount of his accounts. He said: "There is poor Dr. so and so on my floor who for the past two years has lost twenty-five per cent of his accounts. This fellow should be taught some business." Here is the case of a man working every fifth day of his life for nothing and paying his office expenses besides. What is the answer? That man lacks moral courage and perhaps would not avail himself of any agent that would require courage to remedy the present conditions.

There is no excuse for a man losing twenty-five per cent of his accounts unless he is charitably inclined and has made up his mind to make that one of the many ways a dentist has of spreading good cheer. For years I have made it a rigid practice to get special reports on every patient accepted in my office and quite frequently we get reports on old patients once each year. The world is moving fast and quite often the man who could furnish a good report last year would hardly be acceptable this year. If you are going to give every fifth day of your life for nothing, you should at least have the privilege of determining where your charity is to be distributed.

In summarizing I would admonish you to try in your professional life to be what your patients hope and think you are, realizing the necessity of fortifying yourself with an equipment of good health with mental and operative ability that will insure the right kind of confidence in yourself.

Accept patients who you know, think you the best obtainable dentist for them at least. Examine and consult by appointment whenever possible. Get reliable reports on your patients before determining what to do and do not let the patient's mind wander from the subject until there is a perfect understanding. Use study models and elaborate charts. Talk dentistry from a health standpoint continually. Make your consultation appointment when you are at your best mentally, read your dental journals and finally, seriously consider these two admonitions, always lay all your cards on the table when consulting your physician and your banker and especially cultivate the man with a message. These are some of the salient and contributing factors to a successful dental career.

WROUGHT CLASPS AND CONTINUOUS INTERDIGITAL SUPPORTS

By J. WRIGHT BEACH, D.D.S., Buffalo, New York

(Read before the American Dental Association, Los Angeles, California, July 17-21, 1922)

I FIND myself again before my profession in an effort to present recent developments of a method for the retention of removable bridges and partial dentures, the beginning of which took place nearly twenty-five years ago. The primal thought that found lodgment in my mind at that time was the great need of a method of attachments which would prevent undue mutilation of abutment teeth and thereby preserve them in their natural beauty and normal usefulness. We would not stress this point too strongly if we were to say that the perfect human tooth should be idealized and even worshiped by the right-minded dentist, and strict adherence to this high ideal should be his professional religion. Tooth preservation is the first law of dentistry and this mental attitude formed the basis, or actuating motif, of the composite system of retention and support here presented.

This method is closely confined to wrought clasps and indirect supports of various designs. In 1897 or 1898 I began the use of what was then termed the three-point contact clasp of Bonwill (1) for the retention of short span bridges. The principal advancement beyond the Bonwill clasp consisted in the use of No. 14 gauge half-round wire in place of the flat clasp metal. Only within the last few years has the majority of our profession come to realize the important distinction between the broad and the narrow clasp. It has been difficult to substitute the picture of certain destruction which follows the use of the broad clasp by the evidence of safety attending the use of the narrow clasp. Today, however, no organized defense of the small round and half-round wire clasp is required; our present concern is in their proper construction and correct application.

The ideal universal clasp has not yet arrived but it surely is on the way. Contrary to the general impression the technic in the construction of the wrought clasp is more exacting than for the cast clasp when relative results are reached. One may obtain as desired, a rigid or a flexible grasp of a tooth with the wrought clasp, always giving due attention to compensating contact points to avoid orthodontic effect through movement of the teeth in any direction including rotation and elongation. The clasp system improperly applied may become a very effective method of painless extraction. Exactness, therefore is essential, for any deviation from correct adjustment is certain to unseat the tooth carrying the clasp and start a strain of disturbances likely to result seriously.

A correct tooth model of artificial stone or spense metal is the first requisite. Conformation of the clasp is then begun at the lingual-approximal angle, the up and down curves or those in line of longest cross section should be bent first and the adaptation proceeded with very carefully, fitting and adjusting frequently, using care to have the flat surface rest parallel to tooth

surface it grips if a rigid clasp is desired.

This clasp should be placed as near the occlusal surface as practical and esthetic requirements will permit. All clasps and attachments should be as far removed from the gingival as conditions will allow.

When a flexible or movable clasp is desired, the three point contact clasp of Bonwill is made contacting the tooth near the ends of the lips and at the occlusal or stop rest. This adjustment must be worked out with extreme care with both types so that no unopposed forces are applied.

Long ago it ceased to be questionable practice to gain space for the occlusal rest by grinding the opposing teeth (2). It is essential, however, to thoroughly polish such surfaces and, when permissible, to treat the ground points with silver nitrate to immunize them. Because of minimum contact with the tooth surface, I favor the use of round wire when the half-round is not specially indicated, but it is necessary to place it a little further from the occlusal surface. Upon the buccal and lingual surfaces it should be made crescent shape, with the apex toward the gum line, the general outline of which it should simulate. This formation gives the clasp a more rigid grasp upon the tooth. Care must be used again as to forces applied so that elongation or tilting of long axes does not result.

I recommend the cast occlusal rest suggested by Dr. Chappelle wherever surface coverage is not a consideration, as upon fillings, crowns or tooth surfaces where conditions would lead the dentist to anticipate a reasonable degree of resistance to decay.

The broad surface of the cast occlusal rest, calls for less space between opposing teeth and its broader contact reduces the possibility of lateral rocking of the bridge under the stress of mastication.

The continual interdigital support (3) has been employed in my practice for nearly fifteen years. It was devised to aid in overcoming "heel raising" where bicuspids and molars were placed on both sides of the jaw when the lingual bar is used. It is best suited for lower cases and should be placed below the lingual eminence of the anteriors approximately one-third of the length of the crown from the gum line toward incisal edge.

It is constructed of No. 20 gauge round wire, each interdigital unit being fitted to the tooth and when the separate pieces are completed they are united by a small amount of solder. Each end is finally attached to the base wire or lingual bar. I have, however, abandoned the separate unit construction for the casting method, obtaining more satisfactory results because of greater rigidity. The base and interdigital bars are made in one casting. During the last few years I have derived much satisfaction from a new scheme of construction for the placement of two or three posterior teeth where a posterior abutment tooth is missing. It might be termed a double truss construction about the bicuspids, with lingual and labial lip extensions grasping the cuspid. No. 20 gauge round wire is used and the piece might be represented as composed of two full clasps of Jackson, having added an extra wire lingually and labially, being well separated from the gingival bar. Many cases are presented where a piece of this character is required and clinical experience has proven the type of appliance to be useful and practicable. Slight flexibility may be secured to accommodate the saddle to the yielding mucosa by omitting the distoclusal rest upon the bicuspid.

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MINERALOGY FOR STUDENTS OF DENTISTRY

By EDWARD H. KRAUS, Ann Arbor, Michigan

Introduction

FOR many years some knowledge of crystallography and mineralogy has been considered of basic value in the training of geologists, mining and civil engineers, foresters, chemists, pharmacists, and ceramists for their pursuits, of necessity, take them into the field, or involve the use of minerals as raw materials. Many of them also find the use of crystal-optical methods of great value in their analytical and general determinative work. Furthermore, physicists have recently begun to take a lively interest in these subjects, because of the startling results achieved by the application of x-rays to the study of crystal structure.

Although the beginning courses in mineralogy in our larger universities are generally attended by students of greatly diversified interests, the announcement last year that at the University of Michigan all first-year students in the College of Dental Surgery would be required to take a course in this subject was entirely unexpected and surprising to dental educators and teachers of mineralogy. It has therefore been thought highly desirable that a brief description of this instruction, including the objects to be attained, should be given.

Objects

The instruction in dentistry at this university covers a period of five years, divided into one year of pre-dental studies in the College of Literature, Science, and the Arts, or any recognized institution of collegiate standing, and four years of instruction in the College of Dental Surgery. The pre-dental studies include as required subjects: English, zoology, botany, and general and qualitative chemistry; and as electives: foreign languages, mathematics, history, geology, and technical drawing. The fall semester of the first year in the dental college is also devoted to fundamental subjects preparatory to dentistry, and includes physics, organic chemistry, drawing, and mineralogy. The technical instruction begins in the second semester when histology, embryology, and anatomy are begun.

Since the successful dentist must, among other things, be an expert observer, have good power of visualization, and possess manipulative skill to a marked degree, it is obvious that these qualities should be developed as early as possible in his course. It is also of great advantage to the student to learn early, preferably before he has begun the highly technical instruction, that he has at least average ability along the three lines indicated.

This special course in mineralogy attempts first, to develop ability of keen observation and of accurate visualization; second, to determine whether or not the student possesses mechanical or manipulative ability or sense; and third,

to impart a comparatively large amount of valuable general and technical information.

1. *Observation and Visualization.* The recognition of crystal forms occurring on wooden models and natural crystals has long been considered an unexcelled training in keen observation and accurate visualization. This is also true of practice in the determination of unlabeled specimen based upon the recognition of their general physical properties.

2. *Manipulative Skill.* The handling of a precision instrument, such as the mineralogical microscope, requires not only the exercise of great care, but also reveals to a marked extent whether or not a student has or can develop mechanical skill or sense.

3. *General and Technical Information.* It is to be taken for granted that the dentist should be intelligently informed concerning the raw materials which enter into the manufacture of his instruments and materials. This more general information is imparted by describing the important minerals which act as such raw materials. It is obvious that a discussion of the manufacture and structure, especially microscopical, of those dental materials involving the use of minerals or mineral products, such as plaster of Paris and dental porcelains, cements, powders, and pastes will give the student extremely valuable information of a highly technical character.

Conduct of the Course

The course consists of two lectures and a two-hour laboratory period a week for one semester, embracing sixteen weeks of classroom work, exclusive of examinations. After a general introductory lecture the following subjects: crystal forms, physical and chemical properties of minerals, descriptive mineralogy, elementary treatment of optical methods, and the manufacture and general properties, both macroscopical and microscopical, of plaster of Paris and dental porcelains, cements, and pastes are discussed. In the laboratory the student is given training in the recognition of crystal forms, determination of minerals, use of the mineralogical microscope, and in the study and determination of various dental products. Since the laboratory work is very closely supervised, one assistant being available for every six or seven students, rapid progress is assured.

Content of the Course

The ground covered in the various subjects discussed in the lectures and studied in the laboratory will be described briefly.

1. *Crystal Forms.* Aside from imparting an elementary knowledge of crystallization and crystal forms and preparing the way for the rapid recognition of the common minerals, the chief objects to be attained are, as indicated above, the development of keen observation and accurate visualization. About three lectures and four laboratory periods are devoted to this phase of the work. Only the most common and important forms are considered. A special collection of forty-five wooden models has been assembled for this purpose. The laboratory possesses a sufficient number of these collections so that every student in each section is provided with one.

2. *Physical Properties.* These are discussed in three lectures and include luster, color, streak, hardness, specific gravity, magnetism, cleavage, fracture, tenacity, diaphaneity, taste, odor, feel, and structure. On account of the importance of hardness in connection with the proper selection of abrasives and in the manufacture of pastes and powders, this subject is discussed at length.

3. *Chemical Properties.* Three lectures are also devoted to the more essential chemical properties and methods of formation and occurrence of minerals.

4. *Descriptive Mineralogy.* A list of forty-four minerals of vital importance as sources of dental apparatus and supplies are considered in eight lectures in which practical applications are always emphasized.

5. *Determinative Mineralogy.* This work is done in five laboratory periods during which the student learns to identify the minerals discussed in the lectures. This instruction is unexcelled in the development of observation and reasoning ability.

6. *Optical Methods.* In six lectures the construction of the mineralogical microscope and the methods of determining the principal characteristics, such as index of refraction, isotropic or anisotropic character, extinction angles, strength and character of double refraction and so forth, of sections and fragments are presented. These lectures are well illustrated not only with numerous models, but also with slides and mineral sections and powders, which are projected upon the screen by an epidiascope using a mineralogical microscope. In the laboratory the student works through a series of exercises illustrating the above methods and gains sufficient facility so that they can be applied in the study of dental materials. Two and one-half laboratory periods are given over to this work.

7. *Technical Applications.* The necessary scientific foundation having been laid, it is now possible to discuss the manufacture and properties of some of the more important dental supplies, especially those of a non-metallic character.

(a) *Plaster of Paris.* One lecture is devoted to the manufacture of this substance which is of such great importance to the dentist. Its nature, methods of dehydrating gypsum, effects of time and temperature on the process of hydration, impurities, effects of accelerators and retarders, and the cause and nature of "setting" are considered. In the laboratory the constituents of dental plaster are studied under the microscope. The student also observes that "setting" is a crystallization process and notes that the strength of plaster of Paris, after setting, is due to the interlocking of the many minute, slender crystals which have been formed.

(b) *Dental Porcelain.* Two lectures are devoted to the consideration of the manufacture and various properties of teeth and dental porcelain in general. The optical and thermal properties of the raw materials—quartz, feldspar, and kaolin—are first discussed, and in considerable detail. The various steps in the manufacture of artificial teeth are then described, due reference being made to the reactions involved. Porcelain inlays are also referred to. Moreover, the difference between dental and ordinary porcelain is pointed out. In the laboratory, first, observations of the optical properties of the raw materials are made. Then thin sections of finished teeth are studied with respect to the structure and constituents of the product and with reference to the changes the raw materials have undergone.

(c) *Dental Cements.* The nature, composition, preparation, and properties of some of the more important cements constantly used by the dentist are discussed, such as zinc oxid and silicate cements. Theories concerning their setting are also advanced. In the laboratory the various reactions taking place in the setting of a zinc oxid cement are

followed under the microscope. Observations are also made regarding the optical properties, growth, structure, and arrangement of the resultant crystals. A sample of porcelain cement is also studied.

(d) *Dental Powders and Pastes.* Standard preparations now on the market are considered. The properties of the various constituents and methods for their identification under the microscope are presented. The laboratory practice includes the identification of the constituents of several well known preparations.

(e) *Crystalline Salts of the Saliva.* The forms and nature of the products, the result of the evaporation of saliva, as revealed by the microscope, are presented. A list of the important substances thus observed is given. In the laboratory the student is given an opportunity to make these observations.

One lecture is devoted to each of the last three subjects. The laboratory work relating to technical applications is done in about three laboratory periods.

Summary

This course is designed to stimulate and develop observation, visualization, and manipulative ability and skill early in the dental curriculum, especially before the highly technical instruction is begun. This is of great advantage so that those who are markedly deficient along these lines may be advised to prepare themselves for other professions. Upon the completion of the course the instructors furnish the administrative officers of the College of Dental Surgery with estimates of each student's ability along the several lines indicated above, which are taken into consideration in evaluating the student's chances of success in the subsequent strictly professional courses. The results obtained thus far indicate that this special course will unquestionably prove of great value in the training of better equipped dentists with broad interests.

THE APPLICATION OF THE SPRING PRINCIPLE FOR STABILIZING PARTIAL DENTURES

By L. E. CUSTER, A.M., D.D.S., F.A.C.D., Dayton, Ohio

(Read before the American Dental Association, Los Angeles, California, July 17-21, 1922)

UP TO the present time, the methods and schemes for retaining partial dentures have been, strictly speaking, based upon a certain amount of spring in the attacking appliance which is intended to bind upon the natural teeth with sufficient grip to hold the denture in place. The principal types of these are the Griswold, Roach, Gilmore and Bischoff.

The most serious objection to these, and it is common with all, is the very small latitude of spring in the retaining device. They all require the greatest accuracy of technic in construction and often subsequent readjustments. Second, they all require the crowning of the teeth upon which the appliance is attached. Third, they are not strictly hygienic. Fourth, they do not allow natural movement of the sustaining teeth. Fifth, none of them have a wide latitude of spring and future adjustments are often necessary, thereby shortening the life of the appliance.

The principal feature of the method which I wish to present, is a means of overcoming these objections and to settle this problem for some time to come. The device is the most hygienic in the mouth and the technic is extremely simple. Let us not fool ourselves by saying such a simple device cannot be as satisfactory as a more complicated one. Complication is never the work of a genius. The genius is he who throws out a wheel here, a spring there, and a lever there and reduces to a few working parts.

The scheme which I have to offer is merely the covering of the clasping wire with a thin tube of unvulcanizable soft rubber known as vellum rubber on that part of the clasp that is embedded in the hard vulcanite. The extreme end of the wire is bare and crooked to be engaged in the hard vulcanite to keep the clasp in its place. The vellum rubber, while filling the space between the clasp wire and the hard vulcanite for hygienic purposes, still allows the clasp wire to bend in the body of the hard vulcanite as well as at the exposed end which grasps the tooth. The latitude of safe spring, therefore, will be proportionate to the length and thickness of the soft rubber sheath. With this form of clasp, the longer end of it is contained in the body of the vulcanite and it will be seen that there is room to make a clasp an inch long if necessary so that when our clasp bends say, one-sixty-fourth of an inch when going over the tooth, it has not bent far enough to set up crystallization in the metal spring. Indeed, tests have shown that a piece of No. 16 gauge round clasp wire an inch long can bend one-eighth inch in one direction or one-fourth inch in both directions indefinitely without crystallization. This, you see is far beyond our requirements; even the most irregular teeth do not require a spring of over

one-thirty-second inch in putting the denture to place.

In practice I find that a No. 16 gauge round clasp wire covered with a tubing with a wall one-sixty-fourth inch thick gives the proper range of spring for the average case. The dentist can make this tubing by wrapping a single layer of vellum rubber around a broom straw and vulcanizing the same with other cases and afterwards withdrawing the straw. Don't try to short cut by wrapping the vellum rubber around the clasp wire and vulcanizing with the case for it will flow out of shape. Later on this tubing can be secured of any length through the dental dealer. Vellum rubber does not become hard even after many vulcanizations.

Round clasp wire No. 16 gauge is recommended because it is superior to the flat clasp in many ways. It is not so conspicuous, is more easily formed and it admits of being bent in all directions. Moreover, when in the mouth, it permits of slight vertical spring and does not wear upon the tooth as does a stiff flat clasp; and finally, decay does not take place under it as is sometimes seen under flat clasps.

In my original article, it was recommended that the wire be bent to roughly clasp the plaster tooth on the model and go immediately into the vulcanite. That scheme answered every claim made for it. However, after a year's use and study of the principle, I find that if the wire after being bent to fit the tooth is dropped down to a point just below the first artificial tooth and then bent back at a right angle and there enters the vulcanite, two things have been gained: The clasp wire has still more spring and the vellum rubber tube may be much thinner. Technically speaking, we now have an *offset* clasp which not only operates by reason of its inherent spring, but by the well-known principle of torsion which can now be utilized. By this scheme, the spring of the clasp is almost doubled within the same limitations.

The technic employed in making this clasp is as simple as any laboratory procedure. An inch and a half of No. 16 round clasp wire is bent at right angles about the middle. One end is bent into a sharp hook which forms the extreme end to be engaged in the hard vulcanite to hold the spring in its proper place thereafter. This end, of course, is quite bare. The vellum rubber extends only to the crook. Supposing our case is a lower partial, the wire is placed upon the model just below the first artificial tooth as it stands in the wax. It is then marked at a point where it is to clasp the natural tooth and here it is bent at another right angle and fitted approximately to clasp the plaster tooth. A piece of vellum tubing long enough to reach from the crooked end to the upright bend in the wire with a little excess is slipped over the wire as you would bait a fish hook. The clasp is waxed in its proper place covering the vellum with enough wax to insure a finish without exposing same. The part which clasps the plaster tooth is covered with cement to hold the clasp in its place during flasking and vulcanization.

When the patient returns for the finished case, the clasp can now be easily shaped for the final and most perfect fit to the natural tooth.

In conclusion, it is understood that the plate upon the lingual side is closely fitted to and supports the tooth upon which the clasp bears on the opposite side. So it will be seen that the natural tooth is not at any time moved in its socket. The only movable part is the clasp spring which opens and closes when putting the plate in the mouth, and with a little up and down spring which this form of clasp possesses, the denture also has the necessary amount of play in mastication without loosening the anchoring teeth.

CONSTRUCTIVE CRITICISM LEVELED AT THE HIGHER EDUCATIONAL INSTITUTIONS IN AMERICA

By SAMUEL P. CAPEN, Buffalo, New York[1]

VIEWING American higher education in its cosmic aspects, certain disconcerting facts immediately are evident. Nearly every type of institution, except the agricultural college, is over-crowded, congestion being most pronounced in colleges of arts and science. At the same time, there is a general belief that the intellectual morale of college students has declined. The explanation most frequently given for this, is the "lack of motivation of the college of arts and sciences."

Some of the educational conditions that need to be corrected are:

A. The period devoted to elementary education is too long. Efficiency is offset by new subjects crowded into the curriculum and proof is wanting that the so-called enrichment of the elementary curriculum has increased pupils' intellectual power.

B. Secondary education begins too late and ends too soon, failing to comprehend the whole period of general formal training. It is too diffuse and therefore superficial, providing very imperfectly for the preparation of those who straightway must earn a livelihood.

C. Fifty per cent of the work done in colleges of arts and sciences rightly belongs in the secondary schools, so that it becomes necessary to provide teaching methods and disciplinary regime in college for immature boys and girls rather than for men and women seriously entering upon preparation of their life work. There is a prodigal waste of time in college.

Ignoring for the moment the splendid achievements of the professional schools, the first things clamoring for rectification is the fact that Americans enter upon professional careers at least two years later than citizens of other countries and the delay constantly is being increased by professional interests themselves which seek to extend the time devoted to training and impose higher requirements without reference to their effect on the educational scheme as a whole.

The three obvious steps to provide for the regeneration of education are:

A. Admission to college and continuance there should depend on far more searching process of selection than any that now prevails. The creation of tests all the time is going forward, but the ultimate decision as to whether a student is qualified to remain can justly be made, "if the moral courage of the faculty can stand the strain."

B. As early as possible in the college course there should be provision of opportunities for independent study, carried on in the spirit of research without meticulous oversight and with judgment only of the final results. None should be allowed to graduate who have not demonstrated their capacity for independent study and registered definite mastery of some field of knowledge.

C. The college should adopt all means possible to place secondary edu-

[1]Dr. Samuel P. Capen, former director of the American Council on Education, in his inaugural address as chancellor of the University of Buffalo, New York, Saturday, October 28, leveled constructive criticism at higher institutions generally and expressed the hope that the University of Buffalo, because of its freedom from the fetters of tradition, might set an example in over-coming the conditions he mentioned.

cation where it properly belongs, and enter into co-operation with the school systems from which the majority of its students come for establishment of methods of redistribution that will prove of advantage to college and schools.

The college of arts and sciences must be regenerated or it will die. It will be cut up into a multitude of professional divisions and disappear. Similarly, much of the confusion that now exists in the relation of the college to the professional schools could be cleared up by studies designed to reveal just what general information and what knowledge of special subjects are actually necessary for the several professional courses.

Organizations of doctors, lawyers and dentists are forcing the universities both to extend the period devoted to training in the professional school and to impose higher and higher requirements in the way of preliminary education. Moreover, the demands of each professional group are made without reference to their effect upon the educational scheme as a whole.

If my analysis is correct, it is clear that the United States faces the need of drastic and thorough-going reform in its whole scheme of education to the end that our children and our youth may be more effectively trained and that time may be saved in the process. The reform demanded does not consist of the mere readjustment of the mechanism of administration. It must go to the heart of the undertaking. It must deal with the content of subjects and courses. These must be definitely related to the future careers of the students who pursue them.

The various kinds of professional training must be re-examined with fresh reference to the demands of the professions themselves. And the chaos that prevails in the relationships of the college to the professional schools must shortly be reduced to some kind of order. I am persuaded that both these ends could be furthered by a type of educational research that has rarely been applied to higher education.

There is a phrase that gained wide currency during the war. It may be offensive to chaste academic ears, but it is very expressive. It is "job analysis." Now, job analysis has recently been effectively employed to determine the content of the courses of training for all kinds of artisans. Is it impertinent to propose that it would be very useful in the field of professional training also?

If we could have a series of job analyses of the various professions, I venture to predict that they would be highly suggestive to those charged with professional education.

A wide difference used to exist between the intellectual morale of eastern and western students, the westerners as a rule being more serious and diligent whereas the so-called effete east contained a larger proportion of idlers and those who went to college because they were sent there. Reports now suggest that these differences have been levelled. The intellectual morale of western institutions may still be somewhat higher but in the west also a marked decline is apparent.

A few American colleges are now experimenting with honor courses on the British model. But none of these experiments, as far as I am familiar with them, yet goes far enough. The principle which in British universities applies only to honors students should be adopted by American colleges and be applied universally. None should be allowed to graduate who have not demonstrated their ability for independent study and registered definite mastery of some field of knowledge. Not only would the American baccalaureate degree thus acquire a meaning which it now lacks, but the college of arts and sciences would become as serious and purposeful as are the professional divisions of the university.

MINIMUM REQUIREMENTS

FOR CLASS A DENTAL SCHOOLS, ADOPTED BY THE DENTAL EDUCATIONAL COUNCIL OF AMERICA, AT LOUISVILLE, KENTUCKY, JULY 24, 1916

Revised at New York City, October 22, 1917, and March 26, 1918; at Chicago, Ill., July 31 to August 3, 1918; at Pittsburgh, Pa., April 13 and 14, 1920, and at New York City, October 23, 1922.

The Editor of the

Journal of the American Dental Association,

Dear Sir:

At the request of the Dental Educational Council of America, I have pleasure in transmitting to you for publication in the Journal of the American Dental Association the appended "Minimum Requirements for Class A Dental Schools" as amended by the Council, October 23, 1922.

The Council wishes to acquaint the members of the American Dental Association and the profession generally with its later activities in behalf of dental education, and gladly accepts the opportunity courteously afforded by the Journal to keep the profession informed as to the steps it takes from time to time to elevate the standards of professional education in dentistry.

A careful examination of the subjoined requirements will reveal many revisions of those previously adopted by the Council, but special attention may be directed to Section Nine of Article Two which announces that the requirement of a year of work in a college of liberal arts and science for admission for the session of 1926-27 is a prerequisite for the classification of a dental school of Class A beginning with that session.

Thanking you for your kindly offices in the matter, I am

Very truly yours,

CHAS. L. TURNER,

For the Dental Educational Council of America.

ARTICLE I.—ADMINISTRATIVE POLICY

The Council recognizes that variation and initiative are essential to effective education and does not desire to attempt to fit all schools in every detail to exactly the same mold, yet it believes that there are certain fundamentals that must be observed by every school. Since effective, conscientious and wise administration of the various phases of a school's activity is essential to the proper training of students to become members of the dental profession, the Council considers that the organization, spirit and accomplishments of the administration of any school is fundamental and must weigh heavily in the determination as to whether or not the school is acceptable.

The administrative policy must be satisfactory to the Dental Educational Council of America and should conform in spirit with the main features of the following principles of administrative organization, together with such additional particulars as the progress of dental education may suggest.

1. In order that responsibility may be definitely located the Dean or other executive officer should have authority delegated from Trustees, Regents, or Directors to carry out fair ideals of modern dental education.

2. The voting faculty should hold stated meetings, at least bi-monthly, at which the dean, other officers and members may confer and discuss the interests of the school.

Minutes of the meetings, showing the questions discussed and considered and any votes thereon, should be kept.

3. There should be a graded system of titles to indicate the various responsibilities of the members of the teaching staff, such as Professor, Associate Professor, Assistant

Professor, Instructor, Demonstrator, etc. The spirit and ideals of a school are indicated by its discrimination in conferring titles and the guarding of the higher titles by restriction to those who, by reason of ability, training, experience, and maturity, together with the devotion of a considerable amount of time to the school, are real factors in its life and progress.

4. The school should have in effective operation an adequate system of keeping the records of students by means of which exact knowledge may be obtained of the educational record of a student previous to entrance to the school and of his entire record in the school, including conditions, failures, suspensions, dismissal, expulsion, disciplinary action, etc. When a student is transferred to another school, no part of this record should be omitted from his credentials.

5. The school must publish annually a catalogue or announcement in which should be included a list of its students with their full names arranged by classes; a list of its active teaching staff with the degrees and titles of each; a statement as to fees, entrance requirements, rules of promotion and requirements for graduation; length of terms, vacations, etc.; and a fair representation of its facilities and courses, including the name of the teacher actively in charge of the teaching of each course, and the organization of the curriculum.

6. Since the catalogue of a school is its covenant with prospective students, current students, members of the profession at large, and the public, the Council considers that extensive omissions, misstatements, misrepresentations or exaggerations in a catalogue are not in accord with the fair ideals of an acceptable dental school.

7. A dental school organized and conducted for profit either to individuals or to a corporation, whether in the form of unduly large salaries or rentals or of profit for direct distribution does not meet the standard of fair ideals, as interpreted by the Dental Educational Council of America.

Article II.—Minimum Entrance Requirements

1. The minimum requirements for entrance shall consist of graduation from an accredited high school or academy which requires for graduation not less than fifteen units of high school work obtained in a four-year course, or the equivalent as explained in section 4. No conditions on the foregoing minimum entrance requirements shall be allowed.

2. An accredited high school is defined as one which is accredited as a four-year high school by the United States Bureau of Education or by a University which is a member of the Association of American Universities, or by the State University of the State in which the high school is located.[1]

3. Ninety per cent of the students of any class must be in possession of a diploma from an accredited four-year high school or academy.

4. In the case of an applicant who is not a graduate from a high school or academy, as defined above, the full equivalent of such education in each individual case must be established, and attested by the highest public educational officer or organization of the state in which is located the dental school which the applicant seeks to enter.

5. Applicants who are admitted partially or wholly by examinations, must not constitute more than ten per cent of the class.

6. The foregoing regulations apply to all students, including those from foreign countries, and regardless of where the applicant expects to practice his profession.

7. The entrance credentials or a certified copy thereof, of each student enrolled, must be kept on file in the office of the dental school, or in other institutional office within accessible distance of the dental school, and open to general inspection until after graduation. Not later than ninety days after the opening of school, the Dean shall send to the Secretary of the Dental Educational Council, and, when requested, to the Secretary of the local State Board of Dental Examiners, a complete list arranged by classes of the full names of all Freshmen and other new students enrolled in the school of which he is Dean, together with a certified statement that such list is complete and that each student is possessed of the entrance qualifications outlined above. The list shall contain also the names of students who have enrolled in that school year but have withdrawn from the school before the date such list is sent and the fact of their withdrawal shall be indicated.

8. If the school publishes entrance requirements in advance of this minimum, it shall state what, if any, variations or conditions are allowed, and in the administration of these entrance requirements must not give greater liberality of entrance than is indicated in its published statements.

9. Beginning with the school year 1926-27 the minimum entrance requirement for a class A dental school will be the completion, in addition to fourteen units of secondary school

[1] In the case of southern dental schools, those high schools accredited by the Southern Association of Colleges and Universities may be accepted, if accredited for not less than fifteen units.

education, of one year (thirty semester hours[2]) of collegiate pre-dental education, which shall include six semester hours of English, six semester hours of Chemistry, six semester hours of Biology or Zoology, and Physics, either secondary or collegiate, equivalent to one secondary school unit.

Article III.—Entrance to Advanced Standing

1. Students who present less than thirty semester hours of credit from a standard[3] college or university may receive advanced credit in those subjects of the first year of the dental curriculum in which they have completed fully equivalent college courses, but they shall be required to attend the dental school for four full school years.

2. Students who present at least thirty semester hours of credit from a standard college or university, in addition to fifteen units of secondary school education; and present satisfactory credits for one school year of college English, one school year of college Chemistry, and one school year of college Physics or college Biology or college Zoology,—provided the work in these subjects in each case is equivalent to the corresponding courses in the first year of the dental curriculum,—may be given credit for one semester in time and may be allowed to complete the dental course in three and one-half years, provided further that the dental school can arrange a satisfactory schedule so that such students shall be able to get instruction in the regular courses and under the regular instructors in those subjects for which they do not have credit. The arrangement must be such that in every way the training of such students in the subjects of the first year of the dental curriculum shall be fully equivalent to that received by the regular full four-year students.

Such students may be allowed to enter a dental school at the beginning of the second semester.

3. Students who present sixty or more semester hours of credit from a standard college or university, in addition to fifteen units of secondary school education; and who present satisfactory credits for one school year of college English, two school years of college Chemistry, one school year of college Physics and one school year of college Biology or Zoology,—provided that these courses are fully equivalent to the corresponding courses of the first year of the dental curriculum,—may be allowed to complete the dental course in three years, provided further, that the dental school can arrange a satisfactory schedule so that such students can get courses in the dental subjects taught in the first year of the dental curriculum. Such courses must be fully equivalent to the regular courses of the first year and must be given systematically under competent instructors. Such courses must be taken so as not to diminish the efficiency of the regular work of the second year, and must be completed before the work of the third year is begun.

4. Students who have completed less than two years of medical education, and who present credits from a class A medical school for courses which have been taken within three years just past may receive subject credit in corresponding courses of the dental curriculum in so far as the courses are fairly equivalent in extent and content, but where such medical school courses have not included the features peculiar to the courses given to dental students, the student should be required, by additional work under competent instruction, to accomplish such special features.

5. Graduates in medicine, or those students who have completed two or more years of the curriculum of a class A medical school, may be given advanced time standing of one year and admitted to second year classification in the dental school. They must, however, take, under competent regular instruc-

[2] A semester hour is defined as the amount of instruction given in one hour of didactic work (lecture, recitation, quiz, or examination) per week for a semester of not less than sixteen weeks, exclusive of vacations; or the amount of laboratory or practical work given under instruction during one exercise per week for one semester of not less than sixteen weeks, exclusive of vacations.

Such laboratory or practical exercise must be at least two consecutive clock hours in length. If it is longer than two consecutive clock hours, it still shall be estimated as one exercise.

No additional semester hours shall be reckoned by reason of laboratory or practical exercises being more than two hours in length or by reason of semesters being more than sixteen weeks in length.

Where the school year is divided into three terms, each term being not less than eleven weeks in length, a term hour shall be reckoned as two-thirds of a semester hour.

[3] A standard college or university is defined as one which requires for entrance not less than fifteen units of secondary school education, and which requires for graduation with the degree of A.B., B.S., or equivalent degree, the completion of not less than one hundred and twenty semester hours of work of collegiate grade, with attendance of not less than one hundred and twenty-eight weeks of instruction, exclusive of vacations.

Work in a Junior College which requires not less than fourteen units of secondary education for entrance and which requires at least sixty semester hours of work of collegiate grade for completion of its course, may be considered equivalent to work in a standard college or university, provided that the work of such Junior College is accepted for full value by standard colleges and universities.

tion, all courses in dental technology and other subjects in the first year of the dental curriculum which they have not had, and may be given credit in subjects of the second year of the dental curriculum for corresponding medical school courses that are fairly equivalent, in such amount as to permit them to make up the first year courses in technics. Advanced time standing for men who have completed two or more years of the medical curriculum should not be given in the interval between leaving the medical school and entering the dental school exceeds three years, but this restriction does not apply to graduates of medicine.

6. In the administration of advanced standing to students who have previously been students in other dental schools the following principles should be observed:

(a) The preliminary education of the applicant should be investigated from inspection of original credentials or certified copies thereof, to assure that it is equal in all respects to that required of the members of the class which he seeks to enter, and if it is not he should not be accepted.

(b) Credit should be given only for courses that have been successfully completed and passed. Conditions incurred in the applicant's former school should not be capable of removal by examination in the school he seeks to enter, but such conditioned courses should be repeated.

(c) Credit should not be given for a course until by comparison as to extent and content it is found that such course is fully equivalent to the corresponding course already completed by the class the applicant seeks to enter.

(d) Credit should not be given year for year unless the curricula of the schools concerned for the year concerned are practically identical.

(e) In order that the applicant may be the equal in training of the members of the class he seeks to enter, he should be required to take those courses, if any, which the class he is to enter has had, but which he has not had, and such courses should take precedence over advanced courses.

(f) An applicant for advanced standing should not be given more favorable classification than he would have received had he remained at the school from which he comes.

(g) Students from foreign dental schools (not including Canadian schools), who are not graduates, should not be given credit in any course or subject except after examination.

7. No student applying for advanced standing from any institution other than a dental school may be given more than one year of credit in time.

8. Advanced standing may not be given for work done in a class C dental school in any subjects beyond the first year of the dental curriculum and then only after examinations in each subject, which examination must be fully as comprehensive as those taken by the class which the student seeks to enter.

Article IV.—Faculty and Teaching Staff

The school must maintain a teaching staff of adequate size and made up of teachers of adequate training, ability and experience, and who devote an adequate proportion of their time and energy to teaching.

Since the teaching in dental schools is so specialized that no one individual can teach several subjects effectively, the size of the teaching staff bears a direct relation to the number of subjects taught. Furthermore the amount of individual attention that each student receives depends directly upon the size of the teaching staff and the number of students.

The advance of dental education makes it desirable that, in the near future, the subjects of Anatomy, Bacteriology, Biology, Chemistry, Histology, Pathology, Physics, Physiology, Operative Dentistry, and Prosthetic Dentistry should have as their active teachers in each school, men who are well trained and experienced in their respective subjects and are devoting the major part of their time and attention to education and teaching.

While it is impossible to particularize in detail, the following sections indicate the principles by which the Council will be guided in its judgment as to whether a teaching staff is adequate for an acceptable dental school.

1. (a) The school shall provide a number of regularly appointed teachers in the infirmary at all times while students are in attendance, which shall not be less than one teacher to each twenty students assigned to the infirmary for the hours involved.

(b) The school shall provide at least one regularly appointed teacher to each thirty students in attendance at one time in any science laboratory (Anatomy, Bacteriology, Biology, Chemistry, Histology, Pathology, Physiology, Physics, etc.).

(c) The school shall provide at least one regularly appointed teacher to each forty students in attendance in any technical laboratory at one time.

(d) In the provisions of the three foregoing paragraphs the full quota of teachers shall be in the infirmary or laboratory and devoting their entire time to the class throughout the hours scheduled for instruction in that infirmary or laboratory and shall have no other duties assigned for those hours, in order that there may be no diversion of the

attention of the teacher from the instruction of students in that subject during that period of time.

2. Modern dental education demands that some of the teaching staff shall devote all of their time and energy to the teaching of the dental students, to administation of their departments and to research, and that an additional number shall devote half of their time to such duties.

Therefore, the Dental Educational Council of America does not consider any dental school fully acceptable that does not comply with the following provisions.

3. Each school shall employ and have in service throughout the school year at least four full-time[4] adequately trained, experienced[5] teachers. Of these at least two shall be teachers in the dental subjects, (as distinguished from the fundamental subjects that are commonly taught in colleges of arts and sciences, or in medical schools, viz: Anatomy, Bacteriology, Biology, Chemistry, Drawing, English, Histology, Materia Medica, General Pathology, Physics and Physiology), and in addition each school shall employ and have in service not less than three half-time[6] teachers.

4. No person except such as hold the degree of D.D.S., M.D., Ph.D., B.S., A.B., or equivalent degrees, or who hold a license to practice dentistry or medicine, shall be employed as teachers of dental students, unless the Secretary of the Dental Educational Council of America be notified of the special qualifications of the teacher so engaged. Under no circumstances should undergraduate dental students be employed as teachers in dental subjects.

5. Dental students should be taught separately from those in other departments of a university except that in the non-dental subjects, dental students may be taught with other students, provided that the educational requirements are equivalent.

[4]A full-time teacher is interpreted as one who devotes at least ten half-days per week throughout the school year to teaching and associated dental school duties.

Each full-time teacher in excess of four will reduce by two the requirements of half-time teachers, but the reverse is not permitted.

[5]A teacher cannot be interpreted to be "experienced" until after at least one year of successful teaching in the subject he is teaching or in a closely allied subject.

[6]A half-time teacher is interpreted as one who devotes at least five half-days per week throughout the school year to teaching and associated dental school duties.

Article V.—Equipment and Teaching Facilities

The school should provide adequate class rooms, laboratories and clinical rooms to meet the requirements of modern dental education. The school must conform to the main features of the following requirements.

1. The school should possess, or have unrestricted teaching privileges in class rooms and laboratories sufficient in number and size to accommodate in a satisfactory way the classes or sections of the size usual for the school.

2. A school cannot be considered acceptable nor remain acceptable if it enrolls classes of a size beyond its fair capacity for more than two years in succession.

3. All laboratories, class rooms and clinic rooms should be sufficiently well lighted and ventilated and provided with means of disposal of waste to meet a standard commensurate with modern hygienic requirements.

4. The school must be well equipped with microscopes, instruments, models, charts, teaching specimen, projection lantern, lathes, ovens, vulcanizers and other teaching apparatus, materials and accessories.

Equipment commonly used by students should be in sufficient amount to provide for work individually or in small groups.

In the anatomical laboratory not more than eight students may be assigned to one cadaver, even if working at different times.

5. The conduct, equipment and management of the infirmary and the number and character of the patients presenting themselves at the clinic must be such as to afford to each student adequate instruction in the various operations of dentistry.

The infirmary records must be kept in an efficient and orderly manner. The infirmary must be kept in a high state of cleanliness, be equipped with an efficient sterilizing system and have an adequate x-ray equipment readily available.

6. Since orderliness and cleanliness are cardinal principles of dentistry, no school can be considered acceptable which fails to maintain these principles to a high degree in its class rooms, laboratories and clinic and as well in all parts of its premises.

No school can give proper training to its students unless it enforces a strict observation of operative and personal cleanliness, neatness, decorum, and courtesy.

7. The school should have a library of modern text books and reference books on the

various phases of dentistry and allied subjects, together with files and current numbers of dental and other scientific journals. This library should have an attendant, should be properly indexed and should be placed in a room of adequate size, equipment and accessibility to invite its constant use by the students and teachers.

ARTICLE VI.—COURSE OF STUDY AND CURRICULUM

1. The course of study must be four years in length, each year to consist of not less than thirty-two weeks exclusive of vacations, and teaching should continue for six days of each week.

2. Dental subjects must be taught in each of the four years.

3. No degrees other than Doctor of Dental Surgery, Doctor of Dental Medicine or Doctor of Dental Science may be given.

4. The school must give a course of at least 4400 hours of didactic, laboratory, technical and clinical instruction.

5. The standard number of hours in each subject shall be as follows:

DIVISION I.—Chemistry, etc.

Inorganic Chemistry and Metallurgy	208
Organic and Physiological Chemistry	128
†Physics	48
	—— 384

DIVISION II.—Anatomy, etc.

Anatomy	288
Histology and Embryology	144
Biology	96
	—— 528

DIVISION III.—Physiology, Pharmacology, Materia Medica and Therapeutics.

Physiology	144
Materia Medica, Pharmacology and *General Therapeutics	64
	—— 208

DIVISION IV.—Pathology and Bacteriology.

Bacteriology	128
General Pathology	80
Dental Pathology and *Dental Therapeutics	96
Oral Hygiene	32
*Physical Diagnosis and *Principles of Medicine	16
	—— 352

DIVISION V.—Operative Dentistry, etc.

Dental Anatomy	112
*Comparative Dental Anatomy	16
Operative Technics	192
Operative Dentistry	96
	—— 416

DIVISION VI.—Prosthetic Dentistry, etc.

Prosthetic Technics	448
Crown and Bridge Technics	224
Prosthetic Dentistry	64
	—— 736

DIVISION VII.—Oral Surgery, etc.

Principles of Surgery	16
Oral Surgery	32
Oral Surgery Clinics	48
Exodontia	16
*Anesthesia	16
*Radiology	16
	—— 144

DIVISION VIII.—Orthodontia.

Orthodontia Technics	48
Orthodontia	32
	—— 80

DIVISION IX.—Miscellaneous.

Jurisprudence, Ethics, Economics, History	32
English and Seminar	96
*Technical Drawing	48
	—— 176

DIVISION X.—Clinics.

Operative, Prosthetic, Radiology, Orthodontia, Oral Hygiene, Dental Pathology, Exodontia	1376
Total	——4400

†Students who do not present for entrance at least one unit of high school physics or its equivalent in college physics, must take an additional 48 hours, making a total of 96 hours in physics.

*A subject marked by an asterisk (*) may be transferred to another division decreasing the total for the division from which it is taken and increasing the total for the division to which it is added by the standard number of hours for that subject.

6. The curriculum is grouped into ten divisions. In each division there are stated subjects with a standard number of hours. To afford elasticity to the curriculum, the following provisions are made:

The number of hours in any subject may be decreased not more than twenty per cent provided the number of hours so deducted from the standard number of hours for any subject are transferred to another subject in the division, i. e., the total number of hours for the division is not to be diminished below the standard total.

7. The sequence of presentation of courses and subjects should be based on sound educa-

tional and pedagogical principles. In general the academic[7] subjects should be completed in the first year (with the exception of English where that subject is taught as a Seminar in the later years); the medico-dental[8] subjects should follow the academic subjects and should be completed by the middle of the third year, with the exception of Physical Diagnosis, General Medicine and General Surgery: the technical dental courses may overlap in time the medico-dental[9] subjects and, to a minor extent, the academic subjects, but those dental subjects that are based upon the academic and medico-dental subjects should follow these basic subjects.

Clinical work in any subject should not begin until the technical courses in that subject have been completed and passed.

There should be such concentration in the schedule that the following subjects are completed each within one academic year, avoiding the interruption of a summer vacation, namely: Anatomy, Bacteriology, Biology, Inorganic Chemistry, Physics, Physiology.

8. At this time the Council does not designate in which year or years any subject is to be taught; nor does the Council designate what proportion of the number of hours in any subject should be devoted to didactic work and what proportion to laboratory or practical technic work.

ARTICLE VII.—RULES OF ATTENDANCE, PROMOTION AND GRADUATION

1. In order that the quality of the graduates may be reasonably guaranteed, the school should have in operation and conscientiously enforce rules of promotion and of graduation, which will eliminate from the school, as soon as the fact is reasonably well demonstrated, those students who have either intellectual, manual or moral deficiencies that render them unfit for the profession.

2. An acceptable school shall enforce definite rules bearing upon scholarship, attendance, promotion, and graduation.

3. The Council cannot and does not desire to specify all such rules. They are more vital and more characteristic of the school when worked out by each school from its own experience and as an expression of its own ideals; but certain principles are suggested in the following paragraphs as a basis for each school in meeting the requirements of the Council.

4. Students should not be permitted to matriculate or register for any school year later than the tenth day following the advertised opening date, except that in case of serious personal illness, as attested by a licensed practicing physician, a student may matriculate or register not later than the twentieth day following the advertised opening date.

5. Every regular student must be required to be in attendance for at least eighty-five per cent of each school year, counted from the end of the registration period.

6. In case of serious personal illness, properly attested, during the school year whereby a student's attendance falls to not less than seventy-five per cent, he may be permitted to make up ten per cent to the required eighty-five per cent minimum, by systematic work during vacation under competent instruction at his own expense in an acceptable dental school.

7. The school should adopt a passing mark of seventy-five per cent.

8. A grade between sixty per cent and the passing mark should be deemed a *condition*. This may be removed by an examination prior to the opening of the next school year. Inability to pass the first examination for the removal of a condition should cause the student to be marked "failure" in the subject.

9. A grade below sixty per cent should be deemed a *failure*. A failure may be removed only by the repetition of the course in part or in its entirety, i. e., by additional work under instruction approved by the Dean or the professor in charge of the subject.

10. A student who has a total deficiency by reason of conditions and failures in courses amounting to forty per cent of the scheduled hours of the year,—since such a record gives little promise of successful progress with his class,—should not be allowed to proceed with his class, and, if contineud in the school, should be required to repeat the year.

11. A student should not be promoted until he has passed courses amounting to at least eighty per cent of the total scheduled hours of the year.

12. A student who fails to remove a condition or failure within twelve months from the time it was incurred, should not be allowed to proceed with his class.

[7]The term academic is here used to designate collectively those subjects that are common to the curricula of the college of arts and science and of the dental school, namely, Biology, Drawing, English, Inorganic Chemistry, and Physics.

[8] and [9]The term medico-dental is here used to designate collectively those subjects that are common to the curricula of the medical school and of the dental school, namely, Anatomy, Bacteriology, Embryology, Histology, General Materia Medica, General Medicine, Organic Chemistry, Physiological Chemistry, General Pathology, Physiology, and General Surgery. The term dental subjects is here used to designate collectively those subjects which are peculiar to the dental curriculum.

ARTICLE VIII.—STATE BOARD RECORD

Since the State Dental Examining Boards are the legal guardians of entrance to the profession, the judgment they make upon the product of a dental school is an indication of whether that school is preparing its men sufficiently well to entitle them to practice dentistry. If, in the combined judgment of various State Boards through a series of years, a considerable proportion of the graduates of a school are considered unfit, the school cannot be considered acceptable from the viewpoint of the State Boards, which constitute one-third of the representation of this Council. Therefore the following requirement is formulated:

1. To be considered an acceptable school, the graduates of any school in each year must maintain a combined record of eighty per cent of the applicants for license showing themselves qualified. If for more than two consecutive years the combined records of failures before State Boards of the graduates of any school shall exceed twenty per cent in each year, on reports approved by the Dental Educational Council of America, the school shall not be considered acceptable.

ARTICLE IX.—DEFINITION OF CLASS A, CLASS B, CLASS C, AND UNCLASSIFIED SCHOOLS.

1. A school shall be considered fully acceptable and designated as Class A if, in the judgment of the Dental Educational Council of America, it fairly meets and maintains the requirements as set forth in the preceding Articles.

2. A school which in certain particulars does not meet all of the requirements of the foregoing articles but which, in the judgment of the Council, will be able to meet them within a reasonable time and which meanwhile is, in the judgment of the Council, making full utilization of its facilities and is devoting all of its income to the promotion of teaching and advancement of dental educational knowledge, shall be considered as worthy of assistance and designated as Class B. Such a classification is not considered as derogatory or indicating lack of confidence.

3. A school which cannot, in the judgment of the Council, meet the requirements of the preceding Articles without extensive improvement and complete reorganization; or which is conducted for profit to individuals or to a corporation is not acceptable and shall be designated as Class C.

4. A school which refuses, upon request, to give to the Council or its authorized officers or committees, within a reasonable time, information of a reasonable nature; or which refuses inspection, shall be designated as "Unclassified" and shall not be considered as entitled to the consideration given to Class A and Class B schools. When a school formerly designated as Class A or B, is changed to the unclassified designation, it shall no longer have the right to use its former classification as a designation, but men who were graduated from such a school, while it was duly classified, shall not be deprived of any privilege because of the subsequent transfer of the school to the unclassified designation.

A Class C school which refuses information or inspection shall remain designated as Class C.

THE JOURNAL of the AMERICAN DENTAL ASSOCIATION

Entered as second-class matter, March 22, 1915, at the Post Office at Huntington, Indiana, under the Act of August 24, 1912. Published Monthly.

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SUBSCRIPTION included in the annual membership dues.

SUBSCRIPTION, $2.00 a year, in advance, to non-members, living in all parts of the United States or its possessions. Canada, $3.00. Foreign countries, $3.25. Australia, $4.00. Single copies, 25 cents.

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JOURNALS are not sent beyond the subscription period.

VOL. 10 MAY, 1923 No. 5

Editorial Department

THE FUNCTION OF THE PROFESSIONAL MAN

The professional man's function is to stand squarely between his fellowman and the myriad ulterior influences which bombard him from the cradle to the grave. It is his function to enter more intimately into the weal or woe of humanity than the man of any other calling.

The tradesman is important in the economy of mankind—the man who clothes us is the essential of our modern civilization; the railroad man and navigator transport us from place to place; the farmer waves his wand over the willing earth and brings us the products of the soil.

All of these are beneficent and of immense import to our welfare. But these men are dealing for the most part with commodities, while the professional man is dealing with persons. He comes into more intimate relationship with the very fibers of human existence than does the man in any commercial pursuit. His obligation therefore is keener; more binding and more sacred.

Formerly the professions were limited to three—the Clergy, the Law, and Medicine. The complexities of modern life have developed many ramifications of pursuit which may be called professional.

The functions of the professions change to keep pace with the evolution of human activities. In the beginning the Clergy concerned themselves solely with the problem of preparing people for another world; today the advanced clergyman aims to teach the people how to live in this world. The lawyer formerly managed to get most people into trouble; today he uses his ablest energy in keeping people out of trouble. The doctor for ages contented himself with attacking disease after it had developed; today the aim of the greatest physician is to prevent disease and thus do away with the almost hopeless task of curing it.

In the evolution of professional activity our own calling of dentistry is looming large on the horizon of human welfare. The importance of our function is becoming daily more manifest. To us it is given to guard the very portal of human sustenance and life. The first few inches of the alimentary tract which conveys to the body the nourishment so necessary to its existence are committed to our care, and it is the only part of the entire tract over which humanity has been given the least control. Is it not well therefore that the dentist should consider himself, and that he should be considered by others, as a most important factor in the maintenance of health? To keep the mouth and teeth in a condition of full functional activity is to go a long way toward keeping the entire body healthy and efficient. It is not claiming too much to say that the services of the dentist are a very tangible asset in the prolongation of human life.

All of the professions interlock and each one is helpful to the others. All are humanitarian in their aims, and every true professional man thinks more of the welfare of the community at large than he does of his own personal welfare. The professional man is full of sacrifice and self abnegation. He descends gladly into the deepest depths of the Gethsemane of disaster, disease and despair to rescue a suffering fellow

mortal. He thrusts a willing hand into the welter of evil that agitates the world that he may help to lift humanity into the dawning of a better day. He makes mistakes—he is not perfect—he stumbles and falls—but always he keeps his face turned toward the light.

Over all the land from far and near, from the palace to the hovel, from the potentate to the pauper—to every erring hungry human heart he waves the flag of fellowship and love.

THE PASSING OF A GREAT DENTIST

In the passing of George B. Snow, the dental profession has lost an earnest worker—one who, though well advanced in years, kept abreast of the times and never for a single moment let his interest in dentistry wane.

The last years of his life were spent in a cheerful and happy home in Long Beach, California, where his every need was supplied by a devoted and loving wife. In this home he carried on a series of experiments on the vulcanization of rubber, keeping a well tabulated record of his work such as is done by few investigators.

That you may know of his deep interest in matters pertaining to dentistry, we quote at some length from a letter written by him to J. P. Buckley on November 12, 1921:

> "It has seemed to me that people are going education crazy in the rapid advancement of qualifications necessary for graduation in dentistry. I may be wrong, but it seems as though there was a sentiment calling for more, and yet more, education, with the idea that dental students could receive in a college course all that is necessary to enter at once into practice and do good service to their patients. Possibly this is true, but on the other hand there is a wide difference in the calibre of those who present themselves for instruction, and their ability to receive it. There is also a certain amount of experience and judgment necessary to a successful practice, and it has seemed to me in my experience as a teacher that this was not always acquired in a college course, and it is possible that this is one reason for the discrepancy which has been mentioned between the number of dentists in practice and the number of graduates turned out. Making due allowance for deaths, is it not possible that many of those graduating fail to make a success after a short trial at practice, become discouraged, and take up other occupations?
>
> "I have had the feeling that it would be better if there were a second degree in dentistry, one that could only be attained by those who had made a success, and had shown that they continued to be students, and were adding something to the stock of human knowledge. None of us know it all. There is always room for advancement, and I suppose there

always will be to the end of the world; but this is not thought of by some of our dental graduates. I hear of those who think that when they have a diploma they have reached the summit of their ambition, and sell all their text books. Is it any wonder that these men become discouraged?

"But on the other hand there are plenty of locations which will not support a dental practice carried on by one who has gone to all the expense in time and money now necessary for a course in dentistry; places where amalgam fillings and "jobs on rubber" are about all that the patients require or could pay for. Should there not be an education provided upon such terms that its recipients could afford to take up with what they could get in such places? We can not all practice in large cities, and live in three-story brown stone fronts, by any means.

"I have often thought that it might be well if a student were required to expend part of his time under instruction in a dental office, and I know that some of our graduates from the Buffalo school who have made the best showing in after life have been those who were poor, and were obliged to earn the means so that they could attend, I will say, their last course before graduation, by taking a position as assistants, and so getting a view of dental practice that they would not get in the college course, but the main thing necessary for success is, after all, the ambition to succeed, and the love of that study which is always necessary for advancement. I have always tried to induce students to experiment, and to find out for themselves, so far as possible, the truth of what was taught them, and not to rely too much upon what they heard; for I verily believe that there are many, many short-comings among the teachers in dental colleges."

This letter, written only a little more than a year before Dr. Snow passed away, and in his 87th year, speaks for itself. The life of this man should be an inspiration to all of us, especially the younger men to put forth our best efforts and to take advantage of every opportunity to advance the profession which we follow and which we love.

Medical and Dental News

CALIFORNIA

Provision for the establishment of a child-welfare research station, to work in conjunction with the University of California for the benefit of the community at large, is made in a bill now before the legislature.—San Francisco Jour., January 25, 1923.

"Documents Relating to Vocational Education, Fiscal Years, 1922-23 to 1926-27 inclusive." Bulletin No. 23-A, California State Board of Education.

According to the preface, this bulletin includes all the material contained in agreements entered into between the California State Board of Education and the Federal Board of Vocational Education for the administration of the Federal and State Vocational Education Acts. The material was assembled in order to familiarize the public with the entire scheme of the Federal and State Boards for the promotion of vocational education in California.—Sacramento, 1922.

What Our Dental Hygienist Organization Means to Us: The motto of the organization, "that we may educate ourselves and serve the people, primarily the school child," has been a source of inspiration to us always.

Our aim is two-fold—first, that we may educate ourselves. Training ourselves that we may become broad-minded in all phases pertaining to our work, is a necessary requisite, for one of our endeavors is to spread the gospel of a clean, healthy mouth. With this purpose in view, what could be more valuable than an organization for the exchange of ideas in reference to our studies? The benefit is derived in many ways: It stimulates a desire to seek help from those leading us professionally, and to aid those who may require our assistance. It banishes our self-interests and allows us to realize life's actualities in the realm of others.

The feeling that one has someone to go to for counsel and assistance, if needed, is surely one of the greatest benefits that one could expect to gain. Without the aid of any organization, one would accomplish little, but given some slight assistance in one's work, perplexities vanish.

Secondly, we serve the people, primarily the school child. With this ideal realized, the pinnacle of our inspiration is reached. What could give an individual or an organization greater satisfaction than to know it has rendered a vital service to humanity, not only of value today, but for generations to come?

Our associations are developing friendships that will endure for years. Not only does this bond of friendship pertain to one organization, but contact with many is both an education and a pleasure.

Surely, an organization with ideals as high as ours is worthy of our co-operation, interest, enthusiasm, loyalty and devotion. With a readiness to give to the highest attainments of which our natures are capable, our energy will be rewarded by a spirit of contentment, for even if we fail to reach the goal of our wishes, we will possess the consciousness of having done our best, which is the truest success to which one can aspire.—By Anita M. Junck, D.H., President of the Dental Hygienists of California.

DELAWARE

Medical inspection of the rural school children of Delaware has been made possible through the united efforts of the State Medical and Dental Societies, the School Auxiliary Association, the American Red Cross, the Board of Education, and the Child Welfare Commission. It is expected that this year the

inspection will cover all the schools, and this involves the examination of about 25,000 children. Following the examination parents are notified of any defects found in their children and urged to have the defects corrected. Later a nurse follows up the cases to make sure if possible that the suggestions of the school physicians are followed. The need for this work is indicated by the fact that out of 15,098 children examined during the last school year, only 1,164 were found to be free from defect.—Nation's Health, Chicago, February, 1923.

GEORGIA

The portable dental clinic of the Atlantic public schools reported 11,669 children with defective teeth among pupils of nine public schools examined recently. The 240 members of the Atlanta Dental Society are co-operating in a drive for better teeth among school children, each dentist having agreed to treat at least one child free of charge. Of 6,279 children examined in one week, 5,534 were found to be in need of treatment.—Journal American Medical Association, Chicago, January 20, 1923.

ILLINOIS

The Lay Publicity Educational Campaign of the State Society: Every member of the Illinois State Medical Society is being solicited for a contribution to the fund for carrying on a lay-educational campaign through the newspapers of the state.

It is time the public is made familiar with what the science of medicine has done in the saving of human life; also made familiar with the dangers of quackery and charlatanism.

Through glaring spectacular statements, and bought and paid for space in newspapers and periodicals, the charlatans have distorted medical facts and are menacing the health welfare of the people, by playing on the credulity of the unsophisticated.

So brisk is trade in the cults, that even blacksmiths, carpenters, plumbers and dressmakers are being recruited to take easy courses of from three to six months' duration and hang out shingles as healers.

At the last meeting of the Illinois State Medical Society, it was voted to fight the "quacks" with their own medicine. The council of the Society at its September meeting appointed a committee to devise ways and means to educate the public to the dangers of medical practice by the untrained and uneducated. The committee was instructed to prepare and supervise data to be printed in the daily newspapers and periodicals that will open the eyes of the public as to the progress of medical science, what medicine has done and is doing for humanity, which is intended to specifically impress upon the people at large, that a sick man needs a doctor and not a mountebank. Articles for the lay press will be handled by a reliable organization, familiar with the best methods of securing results from publicity propaganda.

Educational data will be placed before the public largely through the lay press, assisted by lectures, pamphlets, etc. The subject matter for the press, pamphlets, and the themes for the addresses to be made in public places, will be educative, elucidative and general. Exploitation of individuals or paternalistic theories will be disbarred. This campaign will be along lines showing the virtues of the real in contrast to the dangers of the bogus. It will open the eyes of the men who are too ignorant to distinguish medical skill from "buncum" and clear away the fogs from those who should know better, but who do not,—turned in the wrong direction, perhaps, by some careless physician who is prone to despise the "day of small things," and laughed away the seeming trivial pain that a patient complained of because only appendectomy or a cancer of one of the great organs was of moment enough for consideration.

The United States Government has found it expedient to advertise government securities in this day of get-rich schemes. Purveyors of natural resources, such as leather, wool, butter and eggs, are advertising daily the difference of their products over the synthetic wares flooding the markets.

Medicine must retain its traditional dignity, but when the health welfare of the people is jeopardized, she must arise and expose the invaders.—Illinois Medical Journal, February, 1923.

Lay Educational Fund: More than 500 members of the Illinois State Medical Society have subscribed to a fund to publish in the newspapers of the state the profession's method of serving the public, it is reported.—Journal American Medical Association, March 17, 1923.

INDIANA

Reducing Death Rate from Diphtheria: Dr. W. F. King, Secretary of the Indiana State Board of Health makes the start-

ling assertion that if the citizens of the state of Indiana would avail themselves of the service as offered by the Board of Health, that within the short period of one year the terrible scourge of diphtheria would be no longer a thing to be reckoned with; that we would not have one death per thousand, whereas at present the rate is extremely high. Dr. King took particular pains to explain a procedure known as the Schick Test for diphtheria.—The Xi Psi Phi Quarterly, January, 1923.

MASSACHUSETTS

Physician's License Suspended: The board of registration in medicine has suspended the certificate of registration as a physician of Dr. Arthur Stanton Hudson, Boston, for one year, following a hearing based on a complaint that Dr. Hudson was associated with an unregistered practitioner of medicine. The man alleged to have been associated with Dr. Hudson was arrested, and his case will be presented to the grand jury.

MICHIGAN

University Fees Increased: Regents of the University of Michigan, Ann Arbor, announced, January 26, that advanced student fees will be in effect, dating from the autumn semester. The greatest increase will be paid by students in the medical school and dental college, where the increase is $38 for residents of Michigan and $58 for all others. For other schools and colleges, the increase is $3.

Four Years of Dental Work in Flint, Michigan Schools: Kindergarten to and including eighth grade. By William R. Davis, D.D.S Director. Number needing teeth filled or extracted reduced more than 50 per cent.

Decay of permanent teeth reduced more than 70 per cent.

Children with any teeth filled increased more than 60 per cent.

Mouth infection reduced more than 30 per cent.

Need of extraction of permanent teeth for children in clinic reduced more than 85 per cent.

Extraction of deciduous teeth in clinic reduced more than 50 per cent.

Michigan School for the Deaf number needing teeth filled or extracted reduced 65 per cent.

Decay of permanent teeth reduced 75 per cent. Mouth infection reduced 60 per cent.

Dental staff, one full time dentist first year, three the second year, and five the third and fourth years.

All pupils examined once a year with mouth mirror and probe and notices sent to parents.

Total number school examinations 62,302.

Total number sittings in dental clinic 23,352.

Total number vital teeth filled 33,415.

Total number fillings inserted 52,109.

Total number deciduous teeth extracted 24,292.

Total number permanent teeth extracted 7615 (of which 3933 were for indigent adults. The only work done for adults.)

Total number individual administrations local anesthetic 7931.

Total number individual administrations general anesthetic 1100.

Various treatments in clinic 7949.

Population of Flint 100,000.

Average annual budget for four years $11,000, furnished partly by the city council and partly by the Board of Education.

Cost per year less than five cents per 1000 of assessed valuation.

Budget includes cost of six dental equipments, dental supplies and salaries of dentists.

Rooms for clinics furnished by Board of Health and Board of Education in school buildings.

NEW YORK

"Face Specialists" Lose Suit: A verdict of $25,000 was awarded by a jury in the supreme court, February 21, to Miss Florence Clover, according to report, in her suit against Dr. Oswald C. Stackhouse and the John Woodbury Company, Inc., charging that her face was disfigured as the result of treatment to reduce the length of her nose.—Journal American Medical Association, March 17, 1923.

Case of Leprosy at Bellevue: A case of leprosy was recorded at Bellevue Hospital, March 3, when Abraham Wiener, 50 years old was transferred there from the Jefferson Davis Hospital. The patient was placed in the contagious ward. He came to New York about three weeks ago. This is the only case of leprosy in New York City, as far as known.—Journal American Medical Association, March 17, 1923.

New Health Commissioner Named: Mayor Hylan made official announcement of the appointment of Dr. Frank J. Monaghan to the post of health commissioner of the city of New York, to succeed Dr. Royal S. Copeland, who has become

United States senator. Dr. Monaghan entered the department of health at the beginning of Mayor Hylan's first term and has been the deputy commissioner.—Journal American Medical Association, March 17, 1923.

OHIO

Chiropractors to Serve Prison Sentences: It is reported that four chiropractors were sentenced to the Canton workhouse and one to Trumbull County Jail, January 27, by Squire Matteson at Warren, when they refused to pay $500 fines for practicing without a license. Ten of the seventeen chiropractors awaiting trial at Youngstown for practicing medicine without a license state that they will go to prison rather than pay fines which go to the state medical board for their further prosecution. Fifteen chiropractors have been arrested in Cincinnati and are now awaiting trial; nine were arrested in Columbus, January 27. It is reported that all unlicensed chiropractors in Dayton will be arrested. Hearings of cases against chiropractors are also scheduled at Girard and Niles.—Journal of the American Medical Association, February 17, 1923.

FOREIGN

Press Bulletins to be Issued by Ontario Dentists: The Board of Directors of the Royal College of Dental Surgeons, and the Oral Hygiene Committee of the Ontario Dental Association, are uniting for the purpose of conducting an educational campaign in the interest of public health, through the publication of a series of bulletins upon the value of the teeth, the care of the mouth, and the relation of the teeth to bodily health and disease.

These bulletins will be published in the daily press of the Province, appearing weekly for a period of about three months, beginning about the middle of February.—Oral Health, February, 1923.

"Rural Welfare Work of Mexican Government." By Helen Bowyer, Mexico City: An account of the traveling exhibit of the Mexican Department of Agriculture, which has entered upon an itinerary through the rural communities of the country, using two railroad cars granted by the government for the purpose. The exhibit includes posters on hygiene, food values, housing, child care, cleanliness, and the importance of education. A feature received with great enthusiasm by the younger members of the communities visited is the playground which is set up wherever the exhibit is shown.—Nation's Health, Chicago, February 15, 1923.

Enforcement of School Attendance: A special police force responsible directly to the minister of public instruction enforces the school attendance law in Nicaragua. Members of the force visit the schools in their districts and watch the children entering and leaving school. Children found on the streets during school hours are conducted to school. Every case of absence is investigated and parents are punished for unexcused absences.—La Protection de l' Enfance, Brussels, October, 1922.

Nations Honor Doctor Martyr to Deadly X-Ray: Paris, February 19.—(By the Associated Press.)—For the loss of both arms in the use of x-rays during the last twenty years Dr. Charles Vaillant today was accorded the cravate of the Legion of Honor, a rare honor for a civilian other than the head of the state or a diplomat; the Carnegie hero medal, and the gold medal of the city of Paris.

The celebrated doctor of LaRiboisiere hospital, with both sleeves hanging empty but standing erect and undaunted by misfortune, received the honors at the Hotel DeVille.

The American ambassador, Myron T. Herrick, conferred the Carnegie medal after Gen. A. Y. E. Dubail, grand chancellor of the Legion of Honor, had awarded Dr. Vaillant the cravate.

Mr. Herrick said that Andrew Carnegie had done nothing to meet a truer need than to institute a medal recognizing heroism, but that in Dr. Vaillant's case even this medal was but a feeble recognition of sacrifice and abnegation.

The city of Paris medal, which is another rarely conferred honor, was presented by the president of the municipal council.

Dr. Vaillant, who has worked almost without respite for twenty-five years at LaRiboisiere hospital, and who was one of the first French doctors to apply himself exclusively to the use of x-rays, lost the little finger of his right hand in 1919.

He was warned at that time that if he did not cease using the rays at once he would lose his whole hand. But he stuck to his work, and since then has undergone thirteen operations, losing finger after finger, then his whole right hand, then the fingers of his left, and finally the whole right arm to the shoulder and left nearly to the elbow.

And the end has not been reached yet, for the remainder of the left arm is

certain to go before long, when it is feared the cancerous growth started by the burning of the rays will find an easy road to the heart.

Today, however, Dr. Vaillant appeared the least affected in the whole assembly.—Chicago Daily Tribune, February 20, 1923.

A Tooth as a Cause of Appendicitis: In the Edinburgh Medical and Surgical Journal, published in 1916, there appears an account of a typical case of appendicitis, in which a tooth was found lodged in the appendix, and was presumed to be the cause of the condition.

The symptoms commenced during Saturday night, and the patient died about forty-eight hours afterwards.

A post-mortem examination was performed, and a bicuspid tooth was found in the appendix. No history of a tooth having been swallowed could be obtained: the patient's doctor was of opinion that it was not one of the patient's own teeth, but that it had been taken with food, and he relates an incident of a man who had discovered a tooth inside a roll which he was eating.

It is comparatively rare that appendicitis can be definitely traced to the lodgement of a foreign body in the appendix. It is easy to imagine, however, that the original infection in this particular case might have commenced around the tooth, which was said to have been covered with tartar.—The Dental Surgeon, March 17, 1923.

Systematic Child-Welfare Work among the refugees in Greece is to be undertaken by the American Red Cross in fourteen cities, including Athens, Piraeus, Salonika, Patras, and Corfu. It is expected that the work will result in a permanent Greek organization which will carry on child-welfare work.—Red Cross Courier, Washington, D. C., March 17, 1923.

Dr. Harry Campbell and the Teeth of the "British Lion": Keep your early morning cup of tea. Drink if you want to, smoke if you must, but, for the love of Heaven, have sound teeth. Worship them, make a religion of them. They are the only cure for indigestion." These were some of the observations made by Dr. Harry Campbell in a recent lecture, in London, on the prevention of dyspepsia.

"There is scarcely a sound jaw in these Isles," continued Dr. Campbell. "The British lion has feeble jaws because he is fed on pap. His diet is squashy puddings, poultices of porridge, and soft, spongy bread. And not content with eating rubbish, he eats too much of it. Masticate your food: don't suck it. Watch sheep and camels. Good teeth and mastication are the salvation of dyspeptic martyrs. It would require an army of 30,000 dentists, working day and night, to get the teeth of the British people in anything like a respectable condition. And we are not ashamed of it. I say that if a man loses a tooth he should go into the solitude of his room, draw down the blinds, and read the burial service. It is one of the most serious events in his life."—The Dental Surgeon, March 17, 1923.

GENERAL

If you never break a promise, if you always pay the money you owe exactly on the day it is due, nobody will know but that you are worth a billion. And you will be just as good a risk as a man worth a billion, for all that he could do would be to pay promptly on the due date.—Hamilton Fish.

Death Due to Bad Teeth: Blood poisoning caused by bad teeth and gums was the only theory put forward at the resumed inquest held at Nottingham, on Emma Chapman, who died suddenly, after a doctor had prescribed medicine, and a gargle for an ulcerated throat. The doctor said he could not find any cause of death. The arms and hands were red, as if the woman had died from gas poisoning, but there was no gas in the room in which she died. The city analyst found a small quantity of quinine in the stomach.

A verdict that death was due to blood poisoning was returned. The Coroner said he had known of cases where bad teeth and gums has caused blood poisoning, and it was possible that this was another of such cases.—The Dental Surgeon, March 17, 1923.

"Public Aid to Children in Their Own Homes: A Tabular Summary of State Laws in Effect November 1, 1922. U. S. Dept. of Labor, Children's Bureau, Legal Chart No. 3.

This is a summary in tabular form of the conditions under which aid may be given in each State, the maximum monthly allowance, and the methods of administration.

"Backward Children.": Bulletin of the Russell Sage Foundation Library, No. 57. February, 1923. A selected bibliography of material, for the most part recent, relating to children "who for some cause, local, environmental, physical, or some-

what mental, are slow or dull and cannot progress at the rate that our ordinary school curriculum presupposes."

The Initial Issue of "Hygeia" a monthly "journal of individual and community health" published in Chicago by the American Medical Association—appeared under date of April, 1923. The introductory statement announces that the magazine is to be a medical journal for the general reader. It will deal with "scientific discoveries that are now employed, or that may in the future be used in the prevention or cure of disease, and with economic, social, political, industrial, and educational problems so far as they have a bearing upon the health and welfare of the people."

Dr. James P. Harper Commissioned Colonel: Dr. James P. Harper, dean of the College of Dentistry of St. Louis University, has been notified by the War Department that he has been commissioned Colonel in the Dental Corps of the Reserve Officers Corps of the United States Army, being the first dental officer to attain that rank.

Dr. Harper's promotion in rank is in recognition of his having built up at the St. Louis University Dental College the largest Dental R. O. T. C. in the country, and in June twenty-six graduates of the college will receive commissions as first lieutenants in the Reserve Officers Corps. Captain C. E. Lauderdale, United States Army Medical Corps, now is detailed as commandant of the R. O. T. C. and instructor of military dentistry at the school, which is one of the ten in the United States from which the War Department will draw all future officers of the Dental Corps.

Dentures of Non-Rusting Steel. (Excerpt from Philadelphia Gazette-Democrat.): One result of the war and famine in Germany is the reduced vitality of the teeth and consequent greater prevalence of caries. There is, therefore, an increased demand for dentures. The loss of the colonies and their rubber plantations, cuts off the supply of vulcanite for dentures and the ruinous exchange makes the importation of this article an impossibility. Needless to say, the use of gold for this purpose is out of the question.

Dr. med. dent. Fr. Hauptmeyer describes a process in the "Kruppsche Monatschrift" by which Krupps non-rusting steel can be used for dentures. By means of special methods, this steel plate is made as soft as gold and then fitted to the model of the mouth by means of a hydraulic press. Clamps, suction chambers (probably also the teeth) are attached by the process of electric welding. The finished denture is then highly burnished, this being important to maintain its non-corrosive quality in the mouth. It is stronger than a gold denture and considerably lighter and thinner, having a thickness of 0.2 millimeters.

Dear Doctor King:

Reports that I have heard in Germany showed that the rust-proof steel stood up well in the mouth. The hydraulic press to make these steel plates is quite expensive and I doubt whether it would pay a private practitioner to use one; a prosthetic laboratory in a large town, however, might make use of it.

Dr. Chas. F. Bodecker,
576 Fifth Ave.,
New York, N. Y.

The recent death of Dr. Isaac B. Davenport, the well-known American dentist who practiced for so many years in Paris, recalls the terrible fire which took place in Paris in 1898, at the Bazar de la Charité. The death roll was very large and many of the victims were so shockingly burned that identification was difficult. Many of them moved in high social circles and had been patients of Dr. Davenport and he was able in several instances to establish the identity by the condition of the teeth and by reference to his charts of the mouths which showed the work done. In this way he was able to identify with certainty the remains of the Duchesse d'Alencon, sister of the late Empress of Austria. For his services in connection with the fire he received a Bavarian decoration, and later the French decoration of Officer de l'Académie Francaise.—The British Dental Journal, February 15, 1923.

Root Filling and Wholesale Extraction: It is refreshing to note by a perusal of our dental literature that many who had thrown away their nerve broaches and rushed to purchase forceps, are again beginning to think that perhaps an occasional nerve canal really might possibly be filled, and are again purchasing a few nerve broaches, just a few as yet, but they will get back to larger orders if not crowded. We do not see so much about the one hundred per cent clubs as we did twelve or eighteen months ago. Because the x-ray

revealed to us many of our defects in the filling of root-canals, this should be no reason for the throwing up of hands and quitting, but rather that we should put forth greater effort to succeed in that wherein we had sometimes succeeded and wherein we had sometimes failed. Even the radiograph is not always infallible. It is, however, a wonderful help. Many roots were filled to give useful, harmless service for years before we had dental x-ray machines. Many others that were attempted proved to be failures. Today, with the use of good technic, assisted by the use of the x-ray, the percentage of failures can be wonderfully reduced, and the matter of wholesale extractions reduced to at least a retail basis.—J. A. Fleming, Dominion Dental Journal.

"Modern Trends in the Health Care of Children." By Homer Folks. Paper read before the Ohio Welfare Conference, Columbus, November 1, 1922.—Nation's Health, Chicago, February 15, 1923.

Extraction During Pregnancy: There is a strong feeling in the minds of a large section of the public that there is great danger in extracting teeth during pregnancy and if such an operation must be performed, that the use of gas as an anesthetic is absolutely contraindicated. There is a faint substratum of truth underlying this idea. Pregnancy is certainly not the time one would choose for performing any surgical operation. But in cases of real emergency operations must be performed during this period. It is a wise rule to avoid extracting teeth during pregnancy, especially during the first three months. But far more harm to mother and child must result from leaving septic stumps in the mouth than from their removal. It may safely be said that the danger of delaying extractions is very real while the danger of the extractions is negligible.

The second point is even more certain than the first. Nitrous oxid is an absolutely safe anesthetic, either during pregnancy or at any other time. The pain of an extraction might easily do considerable harm to a pregnant woman whereas the administration of an anesthetic can do none.

To sum-up, if the extraction is an operation of choice, it may well be delayed. If the tooth to be extracted is doing harm to the patient, pregnancy should not be a bar to the performance of the operation. Lastly, if extraction during pregnancy is necessary, the operation should be done under nitrous oxid anesthesia.—The Dental Surgeon, January 6, 1923.

Mandibles With Impacted Third Molars: January 26, 1923. Dear editor: For the last ten years I have been engaged in research work in connection with solving the many intricate problems associated with the extraction of the impacted lower third molar. In order to efficaciously prosecute this work, it is necessary to examine as many mandibles with impacted third molars as can be procured. There are in some of the offices of the dentists throughout the country mandibles that contain impacted lower third molars, and these mandibles are of very little benefit in their present surroundings. If those dentists who have specimen of this character will be kind enough to communicate with me, it will not only aid me in my research work, but the data acquired will be of material interest to the dental profession.—Dr. George B. Winter, 509 Frisco Bldg., St. Louis, Mo.

Arthur Brisbane, the well-known and popular writer of articles on "Today" which appear in many daily papers, makes some rather pertinent and rational comments upon various subjects, an example of which is the following:

"Mr. Coue has come from France, a happy sincere little person who once invested $20 in a correspondence school course in hypnotism, and has done extremely well since.

"He will have his day and be forgotten, like Mesmer and the others. And the world will come back to the cold, hard fact that the only way to get 'Better and better in every way' is by working harder and harder, living more and more wisely."—Jour. of the Ind. State Med. Assoc., January 15, 1923.

Gold Medals: Following the usual custom of the Radiological Society, gold medals were awarded to four who have rendered some conspicuous service to the science of radiology. This year gold medals were awarded to Maud Slye, Ph. D., Chicago; Dr. Percy Brown, Madison, Wisconsin; Madame Marie Curie, Ph. D., Paris, France, and Dr. Gosta Forsell, Stockholm, Sweden.—Jour. of Radiology, January, 1923.

A Series of Articles on "The Care and Feeding of Infants," addressed to the general medical practitioner, is begun in the issue of the Journal of the American Medical Association (Chicago) for January 6, 1923.

Announcements

CALENDAR OF MEETINGS

NATIONAL SOCIETIES

American Dental Association, September 10-14, 1923, Cleveland, Ohio.

American Medical Association, June 25 to 29, 1923, San Francisco, California.

American Academy of Periodontology, September 7 and 8, 1923, Statler Hotel, Cleveland, Ohio.

American Society of Oral Surgeons and Exodontists, September 4 to 7, 1923, Cleveland, Ohio.

American Dental Society of Europe, August 1, 2, 3 and 4, 1923, Paris, France.

American Society of Dental Radiographers, September 7 and 8, 1923, Cleveland, Ohio.

National Society of Denture Prosthetists, August 27 to September 8, 1923, Cleveland, Ohio.

Pacific Coast Society of Orthodontists, May 14, 15 and 16, 1923, Oakland, California.

Research Commission of the American Dental Association, September 8, at 8:30 P. M. Hollenden Hotel, Cleveland, Ohio.

Xi Psi Phi, September 7 and 8, 1923, Cleveland, Ohio. Headquarters, Winton Hotel.

STATE SOCIETIES

National Capital, first Tuesday of every month.

May

Arkansas, at Little Rock (15, 16, 17).
Indiana, at Indianapolis (14, 15, 16, 17).
Nebraska, at Omaha (14, 15, 16, 17).
New York, at New York City (9, 10, 11, 12).
Pennsylvania, at Philadelphia (15, 16, 17).
South Dakota, at Huron (10, 11, 12).
West Virginia, at Wheeling (21, 22, 23).

June

California, at San Francisco (11-15).
Colorado, Troutdale-in-the-pines, (14, 15, 16).
Idaho, at Boise.
Maine, at Augusta (26, 27, 28).
New Hampshire, at The Weirs (21, 22).
New Mexico, at Albuquerque (18, 19, 20).
North Dakota, at Bismarck (5, 6, 7).
South Carolina, at Myrtle Beach.
Southern California, at Los Angeles (18, 19, 20).
Utah, at Salt Lake City (27, 28, 29, 30).
Washington, at Walla Walla (11, 12, 13).
Wyoming, at Laramie (19, 20, 21).

July

Montana, at Missoula.
Wisconsin, at Milwaukee (10, 11, 12).

September

Delaware, at Wilmington (12).

November

Arizona, at Chandler (2, 3).
Georgia, at Athens (7, 8, 9).

MEETINGS OF STATE BOARD OF DENTAL EXAMINERS

Alabama, at Birmingham Dental College, Birmingham, June 20. Secretary-Treasurer, H. C. Hassell, 616—22nd Avenue, Tuscaloosa, Alabama.

Arkansas, at Arlington Hotel, Hot Springs, July 9, 10 and 11. Secretary, H. J. Crume, Wilson Building, El Dorado, Arkansas.

California, at San Francisco, May 19, and Los Angeles, June 11. Secretary, C. A. Herrick, 133 Geary Street, San Francisco, California.

Colorado, at Denver, first Tuesdays of June and December. Secretary, Wm. H. Flint, Littleton, Colorado.

Connecticut, at Hartford, June 21, 22 and 23. Recorder, Arthur B. Holmes, 63 Bank Street, Waterbury, Connecticut.

Delaware, at Municipal Building, 10th and King Streets, Wilmington, June 20 and 21. W. S. P. Combs, Middletown, Delaware.

Florida, at Jacksonville, June 27, 28, 29 and 30. R. P. Taylor, 414 St. James Bldg., Jacksonville, Florida.

Georgia, at Capitol Building, Atlanta, May 28. Secretary-Treasurer, D. D. Atkinson. Brunswick, Georgia.

Illinois, at Room 1006 City Hall, 1007 County Building, Chicago, June 19, 20, 21, 22 and November 13, 14, 15, 16.

Indiana, at State House, Indianapolis, June 11 to 16 inclusive. Secretary, H. C. McKittrick, 1006 I.O.O.F. Building, Indianapolis, Indiana.

Iowa, at College of Dentistry, Iowa City, May 28. Secretary, C. B. Miller, 726 Fleming Building, Des Moines, Iowa.

Kansas, at Wichita, June 18 to 23. Secretary, G. F. Ambrose, El Dorado, Kansas.

Kentucky, at Louisville, June 11. Secretary, J. H. Baldwin, 908 Francis Building, Louisville, Kentucky.

Maine, at State House, Augusta, June 28, 29 and 30. Secretary, Henry Gilman, 192 State Street, Portland, Oregon.

Maryland, at University of Maryland, Baltimore, May 29, 30 and 31. Secretary, T. L. McCarriar, 1822 N. Charles Street, Baltimore, Maryland.

Massachusetts, at —, June 19, 20, 21, 22, 23, 25, 26, 27 and 28. Secretary, J. N. Carriere, 146 State House, Boston, Massachusetts.

Michigan, at Dental College, Ann Arbor, June 11 to 16 inclusive. Secretary, B. S. Southerland, 401 Ward Building, Owosso, Michigan.

Minnesota, at University of Minnesota College of Dentistry, Minneapolis, June 22 to 30 inclusive. Secretary-Treasurer, R. B. Wilson, 1133 Lowry Building, St. Paul, Minnesota.

Mississippi, at Capitol Building, Jackson, June 19. Secretary, B. J. Marshall, 6-7 Turner-Cox Building, Marks, Mississippi.

Missouri, at St. Louis, June 8, 9, 11 and 12. Geo. E. Haigh, Jefferson City, Missouri.

Montana, at Helena, July 9 to 12 inclusive. Marshall A. Gates, Helena, Montana.

Nebraska, at Omaha and Lincoln, June 5 to 9. Address, Department of Public Welfare, Lincoln, Nebraska.

New Jersey, at Trenton, June 25 to 29. Secretary, John C. Forsyth, 429 E. State Street, Trenton, New Jersey.

New Mexico, at Albuquerque, June 21, 22 and 23. Clarence C. Clarke, Socorro, New Mexico.

New York, at Albany, June 25 to 28 and September 24 to 27. Minor J. Terry, Albany, New York.

North Carolina, at Raleigh, June 14. Secretary, F. L. Hunt, Asheville, North Carolina.

North Dakota, at Fargo, July 10, 11 and 12. Secretary, Galon Crum, 73 Edwards Building, Fargo, North Dakota.

Ohio, at Dental Department, Ohio State University, Columbus, June 25 to 29. Secretary, Ray R. Smith, 327 E. State Street, Columbus, Ohio.

Oklahoma, at State Capitol Building, Oklahoma City, June 26 to 29 inclusive. Secretary L. M. Doss, 245 American National Bank Building, Oklahoma City, Oklahoma.

Pennsylvania, at Pittsburgh and Philadelphia, June 20, 21, 22 and 23. Secretary, Alexander H. Reynolds, 4630 Chester Avenue, Philadelphia, Pennsylvania.

South Carolina, at The Jefferson Hotel, Columbia, June 22 and 23. Secretary, W. K. Walker, P. O. Box 714, Orangeburg, South Carolina.

South Dakota, at Sioux Falls, June 25. Secretary, L. R. Walston, Redfield, South Dakota.

Tennessee, at Vanderbilt School of Dentistry, Nashville, June 18. Secretary-Treasurer, F. W. Meacham, 911 Hamilton National Bank Building, Chattanooga, Tennessee.

Texas, at Dallas, June 18 to 21 inclusive. Secretary, R. L. Rogers, Amarillo, Texas.

Utah, at —, July 9 to 14. S. S. Burnham, 721 Boston Building, Salt Lake City, Utah.

Vermont, at Montpelier, June 25, 26 and 27. H. F. Hamilton, Newport, Vermont.

Virginia, at Medical College of Virginia, Richmond, June 12, Secretary, J. P. Stiff, Fredericksburg, Virginia.

Washington, at Walla Walla, June 13. Director, Fred J. Dibble, Department of Licenses, Olympia, Washington.

West Virginia, at Huntington, June 26. Secretary, R. Mason Hite, Mannington, West Virginia.

Wisconsin, at Milwaukee, June 25 to 29 inclusive. Secretary, J. L. Blish, Fond du Lac, Wisconsin.

Wyoming, at Cheyenne, June 26, 27 and 28. Secretary, Peter Appel, Jr., P. O. Box 643, Cheyenne, Wyoming.

MONTANA STATE BOARD OF DENTAL EXAMINERS

The next meeting of the Montana State Board of Dental Examiners will be held in Helena, July 9 to 12 inclusive. For further information address,

MARSHALL E. GATES,
Helena, Montana.

FLORIDA STATE BOARD OF DENTAL EXAMINERS

The Florida State Board of Dental Examiners will hold its next annual meeting in Jacksonville, Florida, June 27, 28, 29 and 30, 1923.

For further information, address

R. P. TAYLOR,
414 St. James Bldg., Jacksonville, Fla.

VERMONT STATE BOARD OF DENTAL EXAMINERS

The next meeting of the Vermont State Board of Dental Examiners will be held June 25, 26 and 27, 1923, at Montpelier, Vermont.

For further information, address

H. F. HAMILTON,
Newport, Vt.

TENNESSEE STATE BOARD OF DENTAL EXAMINERS

The Tennessee Board of Dental Examiners will meet at 10 A. M., June 18, 1923 at Hermitage Hotel, Nashville, Tennessee, where we will hold executive session, examine credentials of applicants, etc. Examinations proper will be held at Vanderbilt School of Dentistry. Hygienists will be examined at the same time.

For applications, address

F. W. MEACHAM, *Sec'y-Treas.*,
911 Hamilton National Bank Bldg.,
Chattanooga, Tenn.

PACIFIC COAST SOCIETY OF ORTHODONTISTS

The Tenth Annual Meeting of the Pacific Coast Society of Othodontists will be held at The Hotel Oakland, Oakland, California, May 14, 15 and 16, 1923. All interested in orthodontia are cordially invited to attend.

A. A. SOLLEY, *President*,
925 Butler Bldg., San Francisco, Cal.
CARL O. ENGSTROM, *Secretary*,
306 Hagelstein Bldg., Sacramento Cal.

NEW MEXICO STATE BOARD OF DENTAL EXAMINERS

The next examination of the New Mexico State Board will be held June 21, 22 and 23 at Albuquerque.

For further information, address

CLARENCE C. CLARKE,
Socorro, New Mexico

MISSOURI STATE BOARD OF DENTAL EXAMINERS

The next meeting of the Missouri Dental Board will be held in St. Louis, June 8, 9, 11 and 12, 1923. For further information regarding same, address

GEO. E. HAIGH,
Jefferson City, Mo.

ARKANSAS STATE BOARD OF DENTAL EXAMINERS

The Arkansas State Board of Dental Examiners will hold its regular meeting at the Arlington Hotel, Hot Springs, Arkansas, July 9, 10 and 11, 1923, for the purpose of examining applicants for license to practice in this state.

Application blanks and full information will be furnished, by the secretary, upon receipt of request.

H. J. CRUME, *Secretary*,
Wilson Bldg., El Dorado, Arkansas.

NORTH DAKOTA STATE BOARD OF DENTAL EXAMINERS

The next meeting of the North Dakota State Board of Dental Examiners will be held at Fargo, North Dakota, July 10, 11 and 12, 1923.

For application blanks and further information, address

SOLON CRUM, *Secretary*,
73 Edwards Building, Fargo, N. Dak.

RESOLUTIONS OF THE ROCHESTER DENTAL SOCIETY

WHEREAS, Almighty God in his infinite wisdom has seen fit to call from his earthly labors, our fellow member Dr. Roy J. Holcombe, and

WHEREAS, our society has lost a skilled and zealous brother, quiet in his manner, sincere in his friendship, with a nobleness of character that won for him, the love and esteem of all who knew him, therefore be it

Resolved, that we, members of the Rochester Dental Society do hereby express our earnest and heartfelt sympathy to the family of our dear brother, and be it further

Resolved, that as a tribute to his memory, the present resolutions be spread upon our minutes and a copy thereof be sent to the Dental Journals and to the bereaved family.

Committee.
G. L. HARTER,
A. A. SULLIVAN,
JOHN T. MCINTEE.

DENTIST NINETY-NINE YEARS OLD DIES

Cleveland, which will soon become the center of dental activities because of the American Dental Association Meeting in September has had to stop and reflect upon the life of one of its pioneer dentists who died at the age of ninety-nine years, having practiced seventy years.

Dr. William Perry Horton, long known in dentistry as an energetic practitioner, and a citizen active in furthering the best interests of the community was born in Pittsford, Vermont, October 28, 1823. He came to Cleveland in 1844, when this city was but eight years old, with about 10,000 inhabitants. He later attended Oberlin college, returning to Cleveland in 1851 and forming a partnership with Dr. Benjamin Strickland, who had established himself as the city's first dentist in 1835.

Dr. Horton's active practice covered a period of nearly seventy years, which, perhaps, constitutes a record.

When the Northern Ohio Dental Association was organized in 1857 Dr. Horton became a charter member of it. He took an active part in the formation of the Ohio State Dental Society, becoming the first president of that organization.

In 1869 he was elected to the Cleveland city council from the old sixth ward and served for a period of eight years. He was also a member of the historic centennial council of thirty-six members.

Dr. Horton, formerly a Whig in politics, was one of the seven men who organized the Republican party. Years later he became a Progressive.

The widow, Mrs. Margaret Horton, three grandchildren and four great-grandchildren, survive.

NEW BOOKS RECEIVED FOR THE LIBRARY OF THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

The Journal of the American Dental Association promptly acknowledges here the receipt of new publications. Books selected from those named on this list are reviewed below. Reviews are matter-of-fact statements of the nature and contents of the publications referred to and are intended *solely to guide possible purchasers.*

Dental Surgery, Questions and Answers for Dental Students. Wesley Barritt, O.B.E., L.D.S. (Eng.) and Alfred Templar Barritt, L.D.S. (Eng.) London, Henry Kimpton, 263 High Holborn, W.C.1., 1922. Price 6/- Net.

Notes on Bacteriology for Dental Students. F. St. J. Steadman, D.P.H., L.R.C.P. (Lond.) M.R.C.S., L.D.S. (Eng.) Publishers, William Wood & Company, 51 Fifth Avenue, New York, N. Y. Price $1.20.

Dental Formulary. Hermann Prinz, A.M., D.D.S., M.D., Professor of Materia Medica and Therapeutics; The Thomas W. Evans Museum and Dental Institute, School of Dentistry, University of Pennsylvania, Philadelphia, Pa. A Practical Guide for the Preparation of Chemical and Technical Compounds and Accessories as Used in the Office and Laboratory by the Dental Practitioner with an Index to Oral Diseases and Their Treatment. Third Edition. Publishers: Lea & Febiger, Philadelphia, Pa. 1923. Price $3.50.

Local Anesthesia in Dentistry, with Special Reference to Infiltration and Conduction. A Guide for Dentists, Oral Surgeons and Students. Professor Dr. Guido Fischer, Director of the Dental Institute of the University of Hamburg. Third American Edition, Thoroughly Revised by Richard H. Riethmuller, Ph.D. (Univ. of Penna.), D.D.S., Professor of Anesthesia, College of Dentistry, University of Southern California; Oral Surgeon to the Los Angeles Community Settlement House. Illustrated with 139 engravings, mostly colored. Publishers: Lea & Febiger, Philadelphia, Pa. 1923. Price $4.50.